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February 15, 1996

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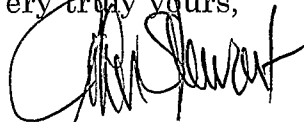
Re: 1990-1992 Cable Royalty Distribution Proceeding
Docket No. 94-3 CARP-90-92CD

Dear Ms. Peters:

Enclosed for filing are an original and five copies of the "Phase I Rebuttal Case of the National Association of Broadcasters" in the above-captioned proceeding.

Should you have any questions, please feel free to contact me.

Very truly yours,



John I. Stewart, Jr.

Enclosures

cc: Service List

CERTIFICATE OF SERVICE

I, Joan L. Weldon, hereby certify that I have caused copies of the foregoing Phase I Rebuttal Case of the National Association of Broadcasters to be delivered by hand this 15th day of February, 1996, to the following:

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Law Offices of John H. Midlen, Jr.
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I further caused copies of the said Phase I Rebuttal Case of the National Association of Broadcasters to be sent by first-class, postage prepaid mail, this 15th day of February, 1996, to the following:

Philip R. Hochberg
Baraff, Koerner, Olender & Hochberg
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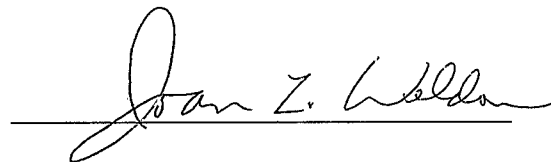
Judith J. Semo
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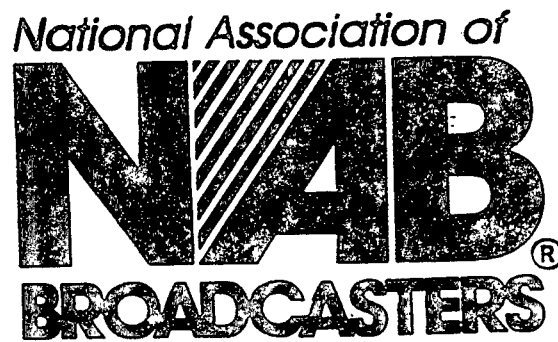
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A handwritten signature in cursive script, reading "Joan Z. Ladd", is written over a horizontal line.



National Association of Broadcasters

PHASE I-REBUTTAL CASE



1990-1992 Cable Copyright Royalty
Distribution Proceeding

REBUTTAL STATEMENT OF RICHARD V. DUCEY

I am appearing on behalf of the National Association of Broadcasters. A summary of my educational background and experience was included as part of my direct testimony in this case.

The purposes of my rebuttal testimony are to present an analysis of cable network fees for news programming comparable to that presented by PBS witness John Fuller, and to provide information about a commercial survey of cable subscribers that refutes the testimony of MPAA witness Robert Sieber about the significance of relative viewing ratings of cable networks.

I. Cable News Network Analysis

I have read the portion of Mr. Fuller's testimony in which he describes the calculation of a PBS royalty share based on an analogy to the licensing fees for the Arts & Entertainment cable television network. PBS Direct Case, Testimony of John W. Fuller, pages 17-24. Using the same methodology presented by Mr. Fuller, I have calculated an estimated royalty share for U.S. commercial television broadcasters based on the licensing fees paid for CNN in the 1990-1992 period.

This kind of analysis is necessarily indirect and imprecise. For example, no cable network programming can be considered a perfect substitute for the programming on distant signals. Moreover, the marketplace negotiations that

determine the price and other terms under which a cable operator ultimately carries a cable network do not occur in the regulated distant signal marketplace. And in order to arrive at a comparable share estimate for distant signal programming based on an analysis of data about cable networks, various adjustments and assumptions must be made.

By contrast, the Bortz survey of cable operators, about which I have testified previously, is a direct measure of the relative value of the programming types actually carried on the distant signals the cable operators chose to purchase under the compulsory license. With this direct evidence available, information about analogous marketplaces should not be relied on in lieu of the Bortz survey results. I am presenting the analogous marketplace analysis that follows only for the purpose of providing a basis for comparison with the analysis presented by other parties.

So that this comparison can be made, I have sought to apply the same methodology Mr. Fuller used, with adjustments only as necessary to account for the differences between PBS and commercial station signal carriage. First, I have selected the CNN cable network service as the most appropriate analogue to station-produced news programming. While not perfectly comparable, I believe this selection is appropriate because CNN provides news and informational programming that is similar in nature to station-produced programming, and

engenders a similar kind of "avidity" among potential subscribers as that I described in my direct case testimony. In fact, I understand that, as NAB witness Caroline Chang testified, CNN airs some news footage that was itself originally produced and broadcast by U.S. commercial stations like KTVU that are carried as distant signals.

Like Arts & Entertainment, CNN is sold to cable operators for a monthly per subscriber license fee. During the years 1990, 1991 and 1992, CNN charged cable operators a top-of-the-rate-card fee of 32, 33 and 35 cents per subscriber per month, respectively.

Before a comparable estimated award for U.S. commercial television station-produced news programming can be derived, two adjustments must be made to the license fee per subscriber figure. First, during the 1990-1992 period, Turner Entertainment Services apparently offered Headline News free when a cable operator carried CNN. To take into account the fact that two cable channels were being received for one price, I have divided the per subscriber license fee in half, resulting in CNN per subscriber fees of 16 cents, 16.5 cents, and 17.5 cents for 1990, 1991, and 1992, respectively.

The second adjustment is to reduce the CNN per subscriber fee to account for the fact that only a portion of the U.S. commercial television signal is made up

of station-produced programming, whereas the CNN license fee is paid for a 24 hour channel of news and information programs. I have based an estimate of the average percentage of time occupied by such programs on distant signals on the reported results of Mr. Lindstrom's viewing study. According to Joint Sports Claimants Exhibits 36-X, 37-X, and 38-X, these percentages were 11.9% for 1990, 14.1% for 1991, and 12.8% for 1992.¹ Multiplying these percentages by the per subscriber fee for CNN results in monthly per subscriber fees of 1.904 cents for 1990, 2.3265 cents for 1991, and 2.240 cents for 1992.

Applying these derived license fees to the total subscriber distant instances of carriage for all commercial television signals during each year from 1990 to 1992 leads to estimated "licensing revenues" for commercial television station-produced programming as reported in Table 1. Since the per subscriber fees are monthly fees, they are multiplied by 12 to get the yearly Total Fee Revenue. To arrive at the final estimated royalty percentages, these figures are divided by the total applicable cable royalties, which in this case include all royalties, not just the Basic Fund to which PBS's analysis was limited, because commercial stations are, unlike PBS stations, subject to the 3.75% fee. The results, with these adjustments

¹ I believe that these percentages understate the average amount of station-produced programming on distant signals, because the stations in the viewing study overrepresent independent stations, which have a smaller percentage of station produced program time than network affiliates.

to reflect the different circumstances of commercial and non-commercial distant signals, can be compared with the results of Mr. Fuller's analysis.

Table 1

| Year | 1990 | 1991 | 1992 |
|----------------------------|--------------|--------------|--------------|
| License Fees | 1.904 | 2.3265 | 2.240 |
| Distant Subscribers | 111,692,735 | 113,843,918 | 115,305,762 |
| Total Fee Revenue | \$25,519,556 | \$31,782,945 | \$30,994,189 |
| Percentage of Royalty Fund | 15.0% | 17.6% | 16.4% |

As with Mr. Fuller's Arts & Entertainment analogy, a further adjustment can be made to these figures to take account of the fact that cable operators are unable to generate any advertising revenue on distant signals. Using the same figures presented by Mr. Fuller (3.6% for 1990, 3.6% for 1991, and 4.1% for 1992), and using the same adjustment methodology presented by Mr. Fuller, the adjusted estimated fee revenues and percentage shares for commercial television station-produced programming are as follows:

Table 2

| | 1990 | 1991 | 1992 |
|----------------------------|--------------|--------------|--------------|
| Total Fee Revenue | \$24,600,852 | \$30,638,759 | \$29,723,427 |
| Percentage of Royalty Fund | 14.5% | 17.0% | 15.8% |

II. Viewing as a Measure of Value for Cable Networks

I have read the portion of Mr. Sieber's testimony in which he discussed the importance of television ratings to the cable industry. I focused specifically on the charts presented ranking selected cable networks by average total day ratings for 1990, 1991, and 1992, and his statement on page 8 of his testimony that "[l]ower ratings equate to a lower subscriber involvement and more limited appeal."

Program Suppliers Direct Case, Testimony of Robert Sieber, pages 8-10.

Contrary to Mr. Sieber's suggestion, the value of a cable network to subscribers and the intensity of subscriber interest in a cable network are not measured by viewing. Even though cable operators may sometimes sell advertising on cable networks, their principal source of revenue is subscriber fees, and, as with distant signals, the programming preferences of their subscribers are more important than the amount of viewing their subscribers might do.

The importance of non-viewing information is demonstrated, for example, by the fact that at least one company, Beta Research Corporation, is in the business of performing periodic survey and market research for numerous cable network and cable operator clients that reports "value" measurements for cable networks. These studies asked random samples of cable subscribers about the value the subscriber placed on various cable networks, the subscriber's satisfaction with those cable networks, and the importance of the cable networks to the subscriber.

According to Beta Research, the studies are purchased by almost every basic cable network and by five of the top ten cable MSO's.

The results of these studies for 1991 and 1992 are summarized in Exhibits 44-R and 45-R, attached to my testimony. They rank selected cable networks in terms of the importance, value, and satisfaction criteria. As you will see by comparing these rankings to the viewing rankings emphasized by Mr. Sieber in his testimony, news and information cable services, like CNN, ranked consistently higher in subscriber valuation than in total day ratings. In general, the viewing measure presented by Mr. Sieber does not correlate well with the value of these programming services to cable subscribers or, consequently, to their value to cable operators.

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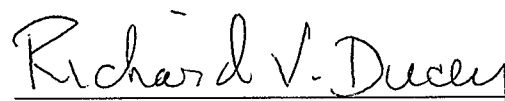
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1990, 1991, and 1992)
Cable Royalty Distribution)
Proceedings)
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Docket No. 94-3 CARP-CD90-92

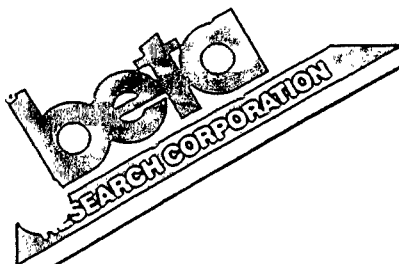
DECLARATION

I, Richard V. Ducey, declare under penalty of perjury that the Rebuttal Statement of Richard V. Ducey presented in the 1990-1992 Cable Copyright Royalty Proceeding is true and correct to the best of my knowledge, information and belief.



Richard V. Ducey

Dated: 2/15/96



NAB 1990-1992 EXHIBIT 44-R

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**EVALUATION OF
CABLE TV SERVICES
AMONG A NATIONAL
SAMPLE OF CABLE TV
SUBSCRIBERS**

- DECEMBER 1991 -

Prepared by:

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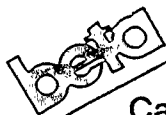
INTRODUCTION

A telephone survey was conducted October 7 – October 27, 1991 among a national sample of cable TV subscribers. The primary objectives were to determine:

- perceived importance, satisfaction and value of basic and premium cable services;
- perceived importance, satisfaction and value of cable services among specific age/sex groups;
- awareness and viewing of cable channels;
- interest in specific new cable services or services with fewer than 25 million subscribers;
- attitudes towards the concept of HBO expanding to three channels (multiplexing).

The survey area consisted of 25 franchise areas of cable systems across the country. The systems were selected on the basis of geography and system size. The larger the cable system, the more likely for inclusion in the sample. An approximately equal number of interviews were completed in each system area. The sample source consisted of telephone numbers of cable subscribers in specific zip codes supplied by the firm Survey Sampling. Screening questions were used to ensure that all respondents were from the selected cable system.

A total of 1,009 interviews were completed with an available head of household. Up to three attempts were made to contact each household selected for the sample. Interviews were evenly divided by sex.



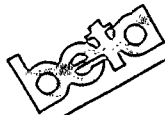
Cable channels were identified by cable channel name and number. The section on newer services or services with less than 25 million subscribers included concept descriptions of services provided by the networks themselves. Evaluative adjectives such as "appealing", "entertaining", etc. were eliminated. A copy of the questionnaire is at the end of this report.

A minimum sample size of 100 viewers of a specific network was required to list the service's value, satisfaction and importance scores in this report.

For each basic service, awareness and viewing percentages are based on persons who receive the service.

An Executive Summary is followed by a more detailed presentation of results. Certain results of the study are compared to the 1990 and 1989 Beta Research national surveys of cable subscribers which were conducted in the same system areas.

ALTHOUGH EXCERPTED RESULTS CAN BE USED IN SALES PRESENTATIONS, THIS FINAL REPORT AND THE COMPUTER PRINTOUT MAY NOT BE REPRODUCED WITHOUT PRIOR PERMISSION. ANY STUDY INFORMATION GIVEN TO THE PRESS OR USED IN TRADE ADS MUST BE APPROVED BY BETA RESEARCH.



HOW TO EVALUATE CABLE TV SERVICES?

A COMMENT ON METHODOLOGY

It is our belief that Nielsen ratings or viewership should not be the sole criterium in evaluating a cable TV service. This study is designed to evaluate cable TV services on a wide variety of measures including:

- evaluation of programming
- perceived importance of the service
- perceived value of the service

Let us assume that service A is viewed by 20% and service B is viewed by 40%. Assume that on importance and value, service A rates very high among the 20% who view while service B rates average among the 40% who view. Service A has a smaller but more intense and loyal audience. It is our opinion that even though its audience is significantly smaller, service A is still a valuable and important service for the cable operator and the advertiser. Yet its value would be hidden if only viewership were measured.

It is true that Nielsen ratings measure actual viewing behavior, while this study measures primarily perceptions of networks. Yet perception and image of a service can be almost as important as actual viewing. A network that has an image of high quality and importance can significantly contribute to the viewer's perception of the value of basic cable as a whole. Also, a product advertised on a network with a positive image may benefit significantly from the association.

In this report, a total of seven different measures are included for each service. A wide variety of scales are used:

- a closed-ended 5-point scale measuring satisfaction with programming
- a four-point verbal scale measuring importance
- an open-ended ratio scale measuring value

Results for importance and value are reported among:

- total persons receiving the service. (These results combine importance/value with viewing.)

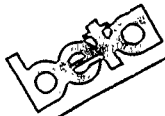
AND

- only viewers of the service. (These results reveal importance/value regardless of audience size.)

Also, results are examined separately for individual age/sex groups.. We hope that this study will be a helpful supplement in determining cable subscribers' attitudes and usage of cable networks.

beta

**SUMMARY
OF
KEY
FINDINGS**



SUMMARY OF KEY FINDINGS

Importance/Value/Satisfaction Among Viewers

1. The following charts reveal the top ranked services for each of the three qualitative scales among persons who ever viewed the service. In general, services ranking high included The Discovery Channel, CNN, ESPN, A&E, The Family Channel, The Weather Channel, Nickelodeon, American Movie Classics, Lifetime, USA Network and TNT. The Travel Channel and The Learning Channel were two services with relatively low viewing but relatively high perceived value among viewers.

—TOP RANKED SERVICES AMONG VIEWERS—

Percent rating important to enjoyment of cable

| | |
|-----------------------|-----|
| The Discovery Channel | 80% |
| CNN/Headline News | 78% |
| ESPN | 77% |
| The Weather Channel | 75% |
| The Family Channel | 73% |
| A&E | 72% |
| Nickelodeon | 72% |
| WWOR | 70% |
| USA | 67% |
| Lifetime | 66% |
| TBS | 66% |

Percent rating programming 4 or 5 on 5-point scale

| | |
|-------------------------|-----|
| The Discovery Channel | 71% |
| CNN/Headline News | 70% |
| ESPN | 69% |
| A&E | 64% |
| Nickelodeon | 63% |
| American Movie Classics | 58% |
| The Weather Channel | 56% |
| The Family Channel | 55% |
| TBS | 52% |
| TNN | 52% |

Average perceived value

| | |
|-------------------------|--------|
| ESPN | \$2.91 |
| The Discovery Channel | \$2.55 |
| CNN/Headline News | \$2.15 |
| A&E | \$2.04 |
| The Family Channel | \$1.85 |
| Nickelodeon | \$1.85 |
| American Movie Classics | \$1.78 |
| The Travel Channel | \$1.64 |
| The Learning Channel | \$1.63 |
| USA Network | \$1.56 |
| TNT | \$1.56 |

Percent rating value \$1 or more

| | |
|-------------------------|-----|
| ESPN | 60% |
| The Discovery Channel | 56% |
| Nickelodeon | 54% |
| CNN/Headline News | 50% |
| The Family Channel | 49% |
| A&E | 47% |
| Lifetime | 47% |
| American Movie Classics | 46% |
| VH-1 | 46% |
| USA | 45% |
| TNT/TBS | 45% |

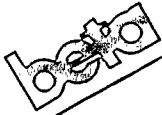
2. On two of the three scales, services that rated particularly high among female viewers included:

- The Family Channel
- Lifetime
- USA Network
- The Learning Channel

As might be expected, ESPN rated higher among male viewers. CNBC was one of the top-ranked services on average perceived value among male viewers.

3. In comparison to 1990, the two services with significant increases on both measures of perceived value were CNN and C-SPAN.

4. Among persons who ever watched, the average premium channel had a perceived value of \$3.27. Among viewers, several basic channels rated equal or higher than



HBO, Showtime, Cinemax and The Movie Channel on importance and evaluation of programming (see detailed report). Among the premium channels, The Disney Channel ranked the highest on satisfaction and importance.

Importance/Value Among Total Cable Subscribers

1. The following charts reveal the top ranked services for the importance and value scales among total cable subscribers receiving the service. Results were calculated by combining the importance/value score with the percent who ever watched. With this method, the rankings of The Weather Channel, USA Network, Lifetime and TNT increased.

—TOP RANKED SERVICES AMONG TOTAL RECEIVING—

Percent rating important

| | |
|-------------------------|-----|
| CNN | 55% |
| The Discovery Channel | 51% |
| ESPN | 46% |
| A&E | 41% |
| The Weather Channel | 40% |
| USA Network | 35% |
| Lifetime | 33% |
| American Movie Classics | 33% |
| TNT | 33% |
| Nickelodeon | 32% |

Average perceived value

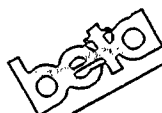
| | |
|-------------------------|--------|
| CNN | \$1.99 |
| ESPN | \$1.80 |
| The Discovery Channel | \$1.63 |
| A&E | \$1.16 |
| American Movie Classics | \$.93 |
| USA Network | \$.84 |
| Nickelodeon | \$.84 |
| TNT | \$.83 |
| The Weather Channel | \$.81 |
| The Family Channel | \$.80 |

Percent rating value \$1 or more

| | |
|-------------------------|-----|
| CNN | 47% |
| ESPN | 37% |
| The Discovery Channel | 36% |
| A&E | 27% |
| USA Network | 24% |
| Lifetime | 24% |
| American Movie Classics | 24% |
| Nickelodeon | 24% |
| TNT | 24% |
| The Weather Channel | 22% |

2. In terms of importance:

- Lifetime, USA Network and The Family Channel ranked particularly high among women
- Nickelodeon and USA Network ranked high among persons age 18–34
- TNT and American Movie Classics were among the top ranked services among persons age 50+.



Awareness/Viewing

Among subscribers receiving the service, the average basic channel:

- achieved aided awareness by 79%
- was ever viewed by 43%
- was viewed over a 7-day period by 26%

Services with highest perceived weekly viewing included: CNN, ESPN, The Discovery Channel, USA Network, The Weather Channel, A&E, TNT and TBS. In comparison to 1990, perceived viewing increased for CNN, The Discovery Channel and C-SPAN. Aided awareness increased for The Discovery Channel, American Movie Classics, C-SPAN, VH-1 and The Learning Channel.

Interest in New Cable Services

1. Of the services listed on the questionnaire, interest was highest in the concepts of The Learning Channel followed by Comedy Central, The Sci-Fi Channel and Nostalgia Television.

| | <u>Percent Rating Interest a 4 or 5 on 5-Point Scale</u> |
|-----------------------------------|--|
| The Learning Channel | 35% |
| Comedy Central | 24% |
| The Sci-Fi Channel | 23% |
| Nostalgia Television | 21% |
| The Monitor Channel | 18% |
| E! Entertainment Television | 16% |
| Bravo..... | 16% |
| The Travel Channel..... | 15% |
| Court TV..... | 13% |

2. The following chart reveals the services that had special appeal among specific sample groups:

Men

The Sci-Fi Channel

Women

The Learning Channel

Nostalgia Television

Bravo

Persons Age 18-34

Comedy Central

(ranked #1 in interest among this group)

Persons Age 18-49

Comedy Central

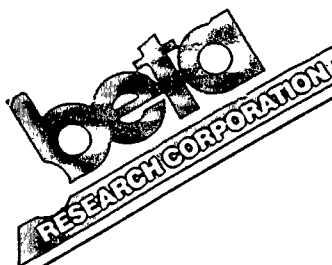
The Sci-Fi Channel

Persons Age 50+

Nostalgia Television

Bravo

The Travel Channel



NAB 1990-1992 EXHIBIT 45-R

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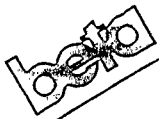
**EVALUATION OF
CABLE AND BROADCAST TV –
SERVICES AMONG A NATIONAL
SAMPLE OF CABLE TV SUBSCRIBERS**

–DECEMBER 1992 –

PREPARED BY:

**BETA RESEARCH CORP.
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SYOSSET, NEW YORK 11791**

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Syosset, New York 11791
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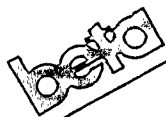
INTRODUCTION

A telephone survey was conducted October 19 – October 31, 1992 among a national sample of cable TV subscribers. The primary objectives were to determine:

- perceived importance, satisfaction and value of cable and broadcast services;
- perceived importance, satisfaction and value of services among specific age/sex groups;
- awareness and perceived viewing of cable channels;
- interest in specific new cable services or services with fewer than 25 million subscribers.

The survey area consisted of 25 franchise areas of cable systems across the country. The systems were selected on the basis of geography and system size. The larger the cable system, the more likely for inclusion in the sample. An approximately equal number of interviews were completed in each system area. The sample source consisted of computer generated random telephone numbers. Screening questions were used to ensure that all respondents were cable subscribers from the selected cable system.

A total of 1,004 interviews were completed with an available head of household. Up to three attempts were made to contact each household selected for the sample. Interviews were evenly divided by sex.



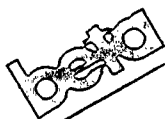
Channels were identified by cable channel name and number. The section on newer services or services with less than 25 million subscribers included concept descriptions of services provided by the networks themselves. Evaluative adjectives such as "appealing", "entertaining", etc. were eliminated. A copy of the questionnaire is at the end of this report.

A minimum sample size of 90 viewers of a specific network was required to list the service's value, satisfaction and importance scores in this report.

For each basic service, awareness and viewing percentages are based on persons who receive the service.

An Executive Summary is followed by a more detailed presentation of results. Certain results of the study are compared to past Beta Research national surveys of cable subscribers which were conducted in the same system areas.

ALTHOUGH EXCERPTED RESULTS CAN BE USED IN SALES PRESENTATIONS, THIS FINAL REPORT AND THE COMPUTER PRINTOUT MAY NOT BE REPRODUCED WITHOUT PRIOR PERMISSION. ANY STUDY INFORMATION GIVEN TO THE PRESS OR USED IN TRADE ADS MUST BE APPROVED BY BETA RESEARCH.



HOW TO EVALUATE CABLE TV SERVICES?

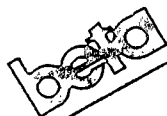
A COMMENT ON METHODOLOGY

It is our belief that Nielsen ratings or viewership should not be the sole factor in evaluating a cable TV service. This study is designed to evaluate cable TV services on a wide variety of measures including:

- evaluation of programming
- perceived importance of the service
- perceived value of the service

Let us assume that service A is viewed by 20% and service B is viewed by 40%. Assume that on importance and value, service A rates very high among the 20% who view while service B rates average among the 40% who view. Service A has a smaller but more intense and loyal audience. It is our opinion that even though its audience is significantly smaller, service A is still a valuable and important service for the cable operator and the advertiser. Yet its value would be hidden if only viewership were measured.

It is true that Nielsen ratings measure actual viewing behavior, while this study measures primarily perceptions of networks. Yet perception and image of a service can be almost as important as actual viewing. A network that has an image of high quality and importance can significantly contribute to the viewer's perception of the value of basic cable as a whole. Also, a product advertised on a network with a positive image may benefit significantly from the association.



In this report, a total of seven different measures are included for each service. A wide variety of scales are used:

- a closed-ended 5-point scale measuring satisfaction with programming
- a four-point verbal scale measuring importance
- an open-ended ratio scale measuring value

Results for importance and value are reported among:

- total persons receiving the service. (These results combine importance/value with viewing.)

AND

- only viewers of the service. (These results reveal importance/value regardless of audience size.)

Also, results are examined separately for individual age/sex groups.. We hope that this study will be a helpful supplement in determining cable subscribers' attitudes and usage of cable and broadcast networks.

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**SUMMARY
OF
KEY
FINDINGS**

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SUMMARY OF KEY FINDINGS

Importance/Value/Satisfaction Among Viewers

1. The following charts reveal the top ranked services for each of the three qualitative scales among persons who ever viewed the service.

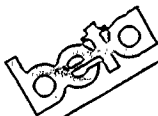
- Basic services ranking high on at least two of the three measures were CNN, The Discovery Channel, ESPN, Nickelodeon, Headline News, The Family Channel, The Weather Channel, USA Network, A&E, TBS, American Movie Classics (AMC) and TNT.
- Among non-fully distributed services, The Learning Channel, Country Music Television and Comedy Central each ranked high on at least one of the qualitative measures.
- Generally, the top rated basic cable networks rated about equal to the broadcast networks on most qualitative measures.

beta

| Top Ranked Basic Services | | Percent of Viewers Rating 4/5 On 5 Point Scale 5 = Excellent 1 = Poor | |
|--|-----|---|-----|
| Percent of Viewers Rating Important | | Top Ranked Basic Services | |
| CNN | 83% | The Discovery Channel | 76% |
| The Discovery Channel | 81% | ESPN | 74% |
| ESPN | 78% | CNN/Headline News | 72% |
| The Weather Channel | 75% | A&E | 64% |
| Headline News | 75% | Nickelodeon | 64% |
| USA Network | 73% | AMC | 64% |
| Nickelodeon | 73% | The Learning Channel | 63% |
| A&E | 70% | Weather Channel | 62% |
| The Family Channel | 70% | Country Music Television | 62% |
| TNT | 70% | Family Channel | 56% |
| TBS | 69% | USA Network | 55% |
| <u>Broadcast Services</u> | | <u>Broadcast Services</u> | |
| ABC | 86% | PBS | 73% |
| NBC | 85% | ABC | 71% |
| CBS | 84% | NBC | 69% |
| PBS | 80% | CBS | 69% |
| FOX | 77% | FOX | 60% |

| <u>Top Ranked Basic Services</u> | <u>Percent Rating Value \$1 or More Among Viewers</u> | <u>Top Ranked Basic Services</u> | <u>Average Perceived Value Among Viewers</u> |
|--------------------------------------|---|--------------------------------------|--|
| ESPN | 51% | ESPN..... | \$2.18 |
| The Discovery Channel..... | 48% | The Discovery Channel..... | \$1.86 |
| CNN | 43% | Nickelodeon | \$1.67 |
| Nickelodeon | 43% | CNN | \$1.53 |
| The Family Channel..... | 37% | MTV | \$1.37 |
| TBS | 37% | Comedy Central | \$1.36 |
| TNT | 37% | The Family Channel..... | \$1.35 |
| USA Network..... | 37% | Headline News | \$1.32 |
| AMC | 37% | TBS | \$1.31 |
| Headline News | 36% | Country Music Television | \$1.26 |
| The Learning Channel..... | 35% | | |
| | | <u>Broadcast Services</u> | |
| <u>Broadcast Services</u> | | PBS | \$1.65 |
| PBS | 43% | ABC | \$1.50 |
| ABC | 40% | NBC | \$1.48 |
| CBS | 40% | CBS | \$1.39 |
| NBC | 39% | FOX | \$1.31 |
| FOX | 38% | | |

- As shown in the detail report, perceived value of almost all basic and premium services dropped significantly in comparison to past Beta surveys. Other measures remained about the same. Conclusion - cable subscribers still have high perception towards basic cable services, but they are less willing to pay for them.
- On perceived value, ESPN, TNT and MTV ranked particularly high among male viewers. Nickelodeon and Family Channel ranked high among female viewers. Nickelodeon, Headline News, Comedy Central and The Learning Channel ranked high among viewers age 18-49. TNN, AMC and TNT ranked high among older viewers age 50+.
- In comparison to 1991, importance among viewers increased for USA Network, The Learning Channel, and CNBC.



- 5 Among persons who ever watched, the average premium channel had a perceived value of \$2.83. In 1991, the average value was \$3.27. Among viewers, several basic channels rated equal or higher than HBO, Showtime, Cinemax and The Movie Channel on importance and evaluation of programming (see detailed report). Among the premium channels, The Disney Channel ranked the highest on satisfaction and importance.

Importance/Value Among Total Cable Subscribers

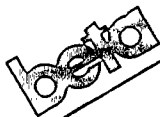
1. The following charts reveal the top ranked services for the importance and value scales among total cable subscribers receiving the service. Results were calculated by combining the importance/value score with the percent who ever watched. With this method, the rankings of broad based services such as USA Network, TBS, Lifetime and the broadcast networks increased.

| <u>Top Ranked Basic Services</u> | <u>Percent of Total Receiving Service Rating Important</u> |
|----------------------------------|--|
| CNN | 65% |
| The Discovery Channel | 52% |
| ESPN | 47% |
| USA Network | 42% |
| The Weather Channel | 40% |
| A&E..... | 39% |
| TBS..... | 39% |
| TNT..... | 38% |
| Lifetime | 35% |
| Headline News..... | 32% |
| <u>Broadcast Services</u> | |
| ABC | 73% |
| NBC | 72% |
| CBS | 71% |
| FOX | 51% |
| PBS..... | 41% |

| <u>Top Ranked Basic Services</u> | <u>Average Perceived Value Among Total</u> | <u>Top Ranked Basic Services</u> | <u>Percent Value \$1 or More Among Total</u> |
|--------------------------------------|--|--------------------------------------|--|
| ESPN | \$1.25 | CNN | 32% |
| The Discovery Channel | \$1.14 | The Discovery Channel ... | 29% |
| CNN | \$1.14 | ESPN | 29% |
| TBS | \$.70 | USA Network | 20% |
| Nickelodeon | \$.69 | TBS | 20% |
| The Weather Channel | \$.61 | TNT | 19% |
| USA Network | \$.60 | Nickelodeon | 19% |
| TNT | \$.58 | A&E | 17% |
| A&E | \$.57 | The Weather Channel | 17% |
| The Family Channel | \$.57 | The Family Channel | 16% |
| Headline News | \$.53 | AMC | 16% |
| <u>Broadcast Services</u> | | <u>Broadcast Services</u> | |
| ABC | \$1.20 | ABC | 33% |
| CBS | \$1.20 | NBC | 32% |
| NBC | \$1.13 | CBS | 32% |
| FOX | \$.85 | FOX | 24% |
| PBS | \$.81 | PBS | 21% |

2. In terms of importance and/or perceived value among total:

- ESPN, TNT and A&E ranked particularly high among men.
- Lifetime, and The Family Channel ranked particularly high among women
- Nickelodeon, USA Network and Comedy Central ranked high among persons age 18-34
- CNN, The Discovery Channel and ESPN ranked the highest basic service among both persons age 18-49 and persons age 50+.



Awareness/Viewing

Among subscribers receiving the service, the average basic channel:

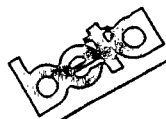
- achieved aided awareness by 78%
- was ever viewed by 40%
- was viewed over a 7-day period by 26%

Services with highest perceived weekly viewing included: CNN, ESPN, The Discovery Channel, USA Network, The Weather Channel, TBS, TNT, A&E and Lifetime. In comparison to 1991, aided awareness increased for The Family Channel, C-SPAN, WGN, Comedy Central and E!

Interest in New Cable Services

1. Of the services listed on the questionnaire, interest was highest in the concepts of ESPN 2 and The Learning Channel followed by The Sci-Fi Channel and Comedy Central.

| | Percent Rating Interest a 4 or 5 <u>On a 5-Point Scale</u> |
|---|---|
| The Learning Channel | 33% |
| The Sci-Fi Channel | 25% |
| Comedy Central..... | 23% |
| Cartoon Network..... | 20% |
| Country Music Television | 20% |
| Nostalgia Television..... | 20% |
| Bravo | 18% |
| E! | 16% |
| Court TV | 15% |
| The Travel Channel | 13% |
| <u>Services Not Launched</u> | |
| ESPN 2 | 35% |
| Game Show Channel..... | 12% |
| Game Channel..... | 9% |
| Differences of less than four percentage points are not statistically significant. | |



2. The following chart reveals the services that had special appeal among specific sample groups:

Men

ESPN 2
The Sci-Fi channel

Women

The Learning Channel
Nostalgia Television

Persons Age 18-34

Comedy Central
The Cartoon Network
The Sci-Fi Channel

Persons Age 18-49

ESPN 2
The Learning Channel

Persons Age 50+

Country Music Television
Nostalgia Television
Bravo

**REBUTTAL STATEMENT OF
THOMAS A. LARSON
ON BEHALF OF
THE NATIONAL ASSOCIATION OF BROADCASTERS**

My name is Thomas A. Larson. I am President and owner of Cable Data Corporation, Bethesda, Maryland. I testified before the Copyright Arbitration Royalty Panel in the direct case portion of this proceeding on behalf of the Devotional Claimants. A statement detailing my personal and professional background appears as Exhibit No. 7 in the Devotional Claimants' Direct Case. Rather than reiterate that information, I incorporate Devotional Claimants' Exhibit No. 7 by reference into this Rebuttal Statement.

As I described in my previous testimony in this case, Cable Data Corporation examines the Statements of Account filed by cable systems with the Library of Congress. From those statements, we collect information reported by each cable system regarding the stations it carries, the number of subscribers it has, and the amount of royalties it pays.

This information is compiled in a proprietary computer database to which various parties in this proceeding, including NAB, subscribe. We provide printouts of the data in a variety of formats, including printouts that show, for each television station, the total number of Form 3 systems that carried it as a distant signal, and the total number of subscribers to those systems. This type of printout also identifies whether each station is an independent station, a network affiliate, or an educational station, and reports the aggregate distant subscriber incident data for all independents, all network affiliates, and all educational

stations separately. In the printouts, Fox affiliates are identified as independent stations.

We provided NAB with such a printout, showing database information as of October 19, 1995, for all Form 3 distant signal carriage for each accounting period for the years 1989-1994. The printout included distant subscriber information on a station by station basis, and total distant subscriber incidents for each type of station for each accounting period.

NAB used the October 19, 1995 printout to create NAB 1990-1992 Exhibit 16-X, which is attached hereto. I have examined NAB 1990-1992 Exhibit 16-X and confirm that the exhibit accurately reports the individual station data and summary data on distant subscriber incidents that we provided NAB in the October 19, 1995 printout.

Before the
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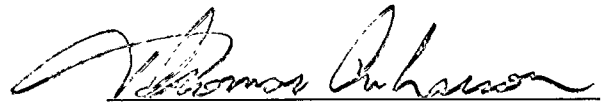
In the Matter of)
)
)

1990, 1991, and 1992)
Cable Royalty Distribution)
Proceedings)
_____)

Docket No. 94-3 CARP-CD90-92

DECLARATION

I, Thomas A. Larson, declare under penalty of perjury that the Rebuttal Statement of Thomas A. Larson On Behalf of the National Association of Broadcasters presented in the 1990-1992 Cable Copyright Royalty Proceeding is true and correct to the best of my knowledge, information and belief.



Thomas A. Larson

Dated: 14 FEB 96

NAB Exhibit
16-X

STATIONS IN BESEN SAMPLE

INDEPENDENTS

| <u>Call</u> <u>Sign</u> | <u>Market</u> | <u>Station</u> <u>Type</u> | <u>Full-Time</u> <u>90-2</u> | <u>Distant</u> <u>91-2</u> | <u>F.3</u> <u>92-2</u> | <u>Subscribers</u> |
|----------------------------|-----------------|-------------------------------|---------------------------------|-------------------------------|---------------------------|--------------------|
| KBHK | San Francisco | Independent | 432817 | 446492 | 249300 | |
| KCAL | Los Angeles | Independent | 273565 | 283441 | 274590 | |
| KCOP | Los Angeles | Independent | 168663 | 195743 | 208730 | |
| KFCB | Concord, CA | Independent | | | 321789 | |
| KHTV | Houston | Independent | | 74064 | | |
| KICU | San Jose | Independent | 418617 | 430339 | 236998 | |
| KMEX | Los Angeles | Independent | 75125 | 75380 | 76843 | |
| KMSP | Minneapolis | Independent | 134423 | 134762 | 139988 | |
| KOFY | San Francisco | Independent | 171985 | 179320 | 183021 | |
| KPLR | St. Louis, MO | Independent | | 84277 | 87771 | |
| KPTV | Portland, OR | Independent | 176926 | 180955 | 189951 | |
| KSHB | Kansas City, MO | Independent | 206909 | 176806 | 180099 | |
| KSTW | Tacoma, WA | Independent | 220812 | 240382 | 248688 | |
| KTLA | Los Angeles | Independent | 904865 | 947005 | 627899 | |
| KTSF | San Francisco | Independent | | | 362084 | |
| KTTV | Los Angeles | Independent | 1007847 | 609723 | 414970 | |
| KTVT | Fort Worth | Independent | 334326 | 336027 | 351604 | |
| KTVU | Oakland | Independent | 638253 | 447376 | 420734 | |
| KTXL | Sacramento | Independent | 457036 | 397639 | 253204 | |
| KVOS | Bellingham, WA | Independent | 281575 | 46472 | | |
| KWGN | Denver | Independent | 211892 | 217279 | 221905 | |
| KXTX | Dallas | Independent | 208695 | 133134 | 140230 | |
| WACX | Leesburg, FL | Independent | | | 137495 | |
| WBFF | Baltimore | Independent | 492349 | 517603 | 487753 | |
| WCFC | Chicago | Independent | | | 124657 | |
| WDCA | Washington | Independent | 406319 | 212206 | 224924 | |
| WFLD | Chicago | Independent | 283744 | 251258 | 268436 | |
| WFXT | Boston | Independent | 110952 | 141029 | 153714 | |
| WGBS | Philadelphia | Independent | 142096 | 175408 | 182477 | |
| WGN | Chicago | Independent | 20055147 | 21657038 | 23431541 | |
| WGNX | Atlanta | Independent | 214581 | 208839 | 202913 | |
| WKBD | Detroit | Independent | 502984 | 441711 | 446621 | |
| WLTV | Miami | Independent | 89722 | 89129 | | |
| WLVI | Cambridge | Independent | 283661 | 194317 | 190201 | |
| WNJU | NYC/Newark | Independent | 160675 | 256717 | 264982 | |
| WNYW | New York | Independent | 396242 | 358396 | 351989 | |
| WPGH | Pittsburgh | Independent | 171562 | 150129 | 136082 | |
| WPHL | Philadelphia | Independent | 466966 | 502526 | 535610 | |

| | | | | | |
|-------------------------------------|--------------------|-------------|----------|----------|----------|
| WPIX | New York | Independent | 3033656 | 3084375 | 2857127 |
| WPTT | Pittsburgh | Independent | | | 75652 |
| WSBK | Boston | Independent | 1973671 | 2111080 | 2141017 |
| WTBS | Atlanta | Independent | 40269030 | 42170459 | 44074667 |
| WTOG | St. Petersburg, FL | Independent | 114464 | 120436 | |
| WTTG | Washington | Independent | 269162 | 155436 | 171694 |
| WTTV | Bloomington, IN | Independent | 87210 | 101582 | 98336 |
| WTWS | New London, CT | Independent | | | 252704 |
| WTFX | Philadelphia | Independent | 822954 | 659725 | 609878 |
| WUAB | Lorain, OH | Independent | 488510 | 547919 | 578874 |
| WVTV | Milwaukee | Independent | 95609 | 102844 | 105141 |
| WWOR | New York | Independent | 12246004 | 12690237 | 12119815 |
| WXIX | Cincinnati | Independent | 236402 | 235304 | 273935 |
| WXTV | Paterson, NJ | Independent | | 62291 | 67450 |
| TOTALS: | | | 89738003 | 92834610 | 95756083 |
| TOTAL ALL INDEPENDENTS: | | | 94224151 | 96914319 | 98668525 |
| % TOTAL OF ALL INDEPENDENTS: | | | 95.24% | 95.79% | 97.05% |

ABC, CBS, NBC AFFILIATES

| <u>Call</u> <u>Sign</u> | <u>Market</u> | <u>Station</u> <u>Type</u> | <u>Full-Time Distant F.3 Subscribers</u> | | |
|----------------------------|-----------------|-------------------------------|--|-------------|-------------|
| | | | <u>90-2</u> | <u>91-2</u> | <u>92-2</u> |
| KABC | Los Angeles | Network | 229291 | 220999 | 185506 |
| KARK | Little Rock | Network | | | 107642 |
| KATU | Portland, OR | Network | 96568 | 93027 | 97975 |
| KATV | Little Rock | Network | 105864 | 102901 | 105124 |
| KCBS | Los Angeles | Network | 220891 | 189784 | 160274 |
| KCCN | Monterey, CA | Network | | | 152733 |
| KCNC | Denver | Network | 197796 | 189900 | 189541 |
| KCRA | Sacramento | Network | 284984 | 290288 | 174990 |
| KDKA | Pittsburgh | Network | 114273 | 114675 | 104657 |
| KFMB | San Diego | Network | 125592 | 132739 | 145306 |
| KGO | San Francisco | Network | 293226 | 299019 | 301307 |
| KGW | Portland, OR | Network | 88106 | 22443 | |
| KMBC | Kansas City, MO | Network | | | 98047 |
| KMGH | Denver | Network | 163387 | 158183 | 157488 |
| KMST | Monterey, CA | Network | 155564 | 153811 | |
| KNBC | Los Angeles | Network | 179356 | 164967 | 135377 |
| KNSD | San Diego | Network | | | 150797 |
| KOIN | Portland, OR | Network | 94972 | 93806 | 98419 |
| KPIX | San Francisco | Network | 358958 | 364532 | 373310 |
| KQTV | St. Joseph, MO | Network | | 74786 | 78801 |
| KRON | San Francisco | Network | 219326 | 238320 | 234911 |
| KSBW | Salinas, CA | Network | 179576 | 177045 | 177689 |
| KSDK | St. Louis | Network | 86088 | 103155 | 99249 |
| KSL | Salt Lake City | Network | 76588 | 73304 | |
| KSNT | Topeka | Network | 97726 | 100943 | 103151 |
| KUSA | Denver | Network | 193260 | 191771 | 194392 |
| KUTV | Salt Lake City | Network | 70937 | 64663 | |
| KXAS | Fort Worth | Network | 75228 | 70483 | |
| KYW | Philadelphia | Network | 171068 | 185448 | 181487 |
| WABC | New York | Network | 397082 | 364898 | 362967 |
| WAGA | Atlanta | Network | 142435 | 154875 | 155076 |
| WBAL | Baltimore | Network | 264335 | 299104 | 203290 |
| WBBM | Chicago | Network | 239584 | 222494 | 99248 |
| WBNS | Columbus | Network | 171957 | 162809 | 178033 |
| WBRC | Birmingham | Network | | | 86542 |
| WBRE | Wilkes Barre | Network | 112928 | 118089 | 118786 |
| WBZ | Boston | Network | 108311 | 110017 | 110640 |
| WCAU | Philadelphia | Network | 268406 | 294583 | 228342 |
| WCBS | New York | Network | 200594 | 196429 | 196998 |
| WDIV | Detroit | Network | 126541 | 128872 | 136790 |

| | | | | | |
|-----------------------------------|-----------------|---------|----------|----------|----------|
| WDTN | Dayton | Network | 158262 | 159137 | 166740 |
| WFAA | Dallas | Network | 162485 | 164735 | 173074 |
| WFMJ | Youngstown, OH | Network | 203395 | 146698 | 147743 |
| WHIO | Dayton | Network | 145541 | 144914 | 148172 |
| WIBW | Topeka | Network | 104226 | 107729 | 115039 |
| WIS | Columbia, SC | Network | | | 116400 |
| WJAR | Providence | Network | 50823 | 55828 | |
| WJBK | Detroit | Network | 18128 | | |
| WJZ | Baltimore | Network | 345075 | 304052 | 256744 |
| WKBN | Youngstown, OH | Network | 134505 | 141827 | 143226 |
| WKEF | Dayton | Network | 167590 | 172544 | 175918 |
| WLYH | Lancaster | Network | | | 76605 |
| WMAR | Baltimore | Network | 235254 | 255813 | 160198 |
| WMTW | Portland, ME | Network | 81774 | 60219 | 62457 |
| WMUR | Manchester, NH | Network | 40300 | | |
| WNBC | New York | Network | 192777 | 188522 | 183336 |
| WNEP | Scranton | Network | 232102 | 145244 | 99757 |
| WPLG | Miami | Network | | 74697 | 75908 |
| WPRI | Providence | Network | 20562 | 23999 | |
| WPVI | Philadelphia | Network | 215626 | 228221 | 224074 |
| WPXI | Pittsburgh | Network | 106515 | 121183 | 128025 |
| WRAL | Raleigh | Network | | | 174635 |
| WSB | Atlanta | Network | 172940 | 178083 | 185589 |
| WSYX | Columbus | Network | | | 136473 |
| WTAE | Pittsburgh | Network | | | 98465 |
| WTRF | Wheeling, WV | Network | | 81251 | 157117 |
| WUSA | Washington | Network | | | 91928 |
| WVIT | New Britain, CT | Network | 94597 | 82399 | 82057 |
| WVTM | Birmingham | Network | 84247 | 77189 | |
| WWLP | Springfield, MA | Network | 89403 | 93537 | 99426 |
| WWSB | Sarasota, FL | Network | 124926 | 130139 | 117926 |
| WXIA | Atlanta | Network | 377043 | 368536 | 382370 |
| WXYZ | Detroit | Network | 43675 | | |
| WYOU | Scranton | Network | 43580 | | |
| TOTAL: | | | 9556149 | 9429658 | 9664287 |
| TOTAL ALL AFFILIATES: | | | 17468584 | 16929599 | 16637237 |
| % TOTAL OF ALL AFFILIATES: | | | 54.70% | 55.70% | 58.09% |

SOURCE:

Documents underlying Besen Study
Cable Data Corp.

EXECUTIVE SUMMARY

I have been asked by counsel for the National Association of Broadcasters ("NAB") to evaluate the econometric model presented in this case by Dr. Stanley Besen. The objective of Dr. Besen's modeling effort was to estimate the relative value to cable system operators of television programming carried on distant signals. My evaluation of Dr. Besen's model focused on two issues: (1) the model's design; and (2) the reliability of the regression estimates of the model's coefficients.

As I explain below, Dr. Besen's model design has omitted many explanatory factors which one would expect to have a significant effect on cable system revenues and thereby on the copyright royalties paid by cable systems. Dr. Besen is incorrect in claiming that he has "controlled" for these other factors. The misspecifications in Dr. Besen's model design were sufficiently severe to render his results unreliable.

Two other significant problems with Dr. Besen's analysis stem from his use of viewing data supplied by MPAA. First, his weighting of the underlying programming data by national viewing numbers is unjustified. Second, the restriction of his study to cable systems carrying only distant signals that were included in MPAA's nonrandom viewing sample means that his study results cannot be generalized to the universe of distant signals.

These misspecification problems are compounded by estimation inaccuracies caused by a data problem which is referred to in the economic literature as multicollinearity. Multicollinearity is caused by the existence of strong correlations among the explanatory factors in the model. Multicollinearity makes it essentially impossible to estimate accurately the coefficients in Dr. Besen's model, thereby

making his estimates of the relative value shares inaccurate. Dr. Besen failed to recognize his multicollinearity problem and therefore took no steps to ameliorate its deleterious effects. I have taken such steps and, while the estimated results still suffer from the effects of misspecification, have obtained much more sensible estimates of the relative value shares by programming type, as follows:

| Programming Type | Estimated Relative Value Shares Generated By The Besen Model When The Multicollinearity Problem is Addressed |
|------------------|--|
| Local | 13.8% |
| Devotional | 11.6% |
| Sports | 31.3% |
| Movies/Series | 43.4% |

Finally, a witness for the Joint Sports Claimants, Mr. Paul Bortz, has submitted a separate survey-based study which provides estimates of the same relative value shares that Dr. Besen attempted to estimate in his study. I have reviewed the paper submitted by Mr. Bortz, including the 1992 survey instrument used by the interviewers, and the survey appears to have been properly done from a survey design viewpoint. I have employed an analytical method that integrates the survey-based estimates generated by Mr. Bortz with the information contained in Dr. Besen's model specification and database. As a result of the weaknesses in both Dr. Besen's model specification and his database and of the strength of Mr. Bortz's analysis, the integrated results are virtually identical to the results presented by Mr. Bortz. I conclude that Dr. Besen's data provide no basis for questioning the relative value share estimates from the Bortz survey.

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REBUTTAL STATEMENT OF GEORGE R. SCHINK

I. Education and Experience

A. Overview

I was awarded a B.S. in Economics from the University of Wisconsin in Madison in 1964, and a Ph.D. in Economics from the University of Pennsylvania in 1971. I was a lecturer in the Department of Economics at the University of Maryland in 1968-1971, teaching various courses in economics, mathematics and econometrics, and also served as a visiting lecturer on economics at the University of Pennsylvania in 1973. I have also been a Research Fellow of the University of Pennsylvania's Economic Research Unit on behalf of Lawrence R. Klein (1965-1968), and was the principal investigator for the quarterly model project of the Brookings Institution (1968-1972).

From 1972-1988, I held various positions with the Wharton Econometric Forecasting Associates Group in Bala Cynwyd, Pennsylvania, including Senior Vice President, Consulting Services and Vice President, Research and Development, and Vice President, U.S. Modeling Services. In 1988, I became Chairman and Chief Executive Officer of AUS Consultants, Industry Analysis Group. I joined the Law and Economics Consulting Group ("LECG") as a Principal in July 1994.

I have done extensive work in econometric estimation and model design. While at The WEFA Group, I was responsible for the development, enhancement, specification, maintenance of the WEFA econometric models and the design, execution, and economic content of large contract research projects, preparation and presentation of testimony, general quality control of WEFA economic analysis and forecasting products, and the design of inputs for econometric and statistical software.

My experience involves a broad range of economic analysis of markets, including market structure and market dynamics, in various industries including energy, utility and telecommunications. I have presented testimony before numerous regulatory bodies, courts and Congress.

A list of proceedings in which I have appeared, and a list of pertinent published and unpublished works which I have authored is appended to my testimony as Attachment 1.

B. Model Design, Development and Evaluation Experience

I have extensive experience relating to the design, estimation and testing of complex large-scale econometric models. My work with model building began when I was in graduate school at the University of Pennsylvania. My primary field was econometrics, and I worked on various large-scale model development projects, particularly with Professor Lawrence R. Klein who won the Nobel Prize in Economics for his modeling work and also with Professor Phoebus Dhrymes. My thesis developed a technique for estimating the expected forecast error in large-scale nonlinear econometric models.

Since leaving graduate school, I have continued to work on modeling issues, including building models for a variety of markets, including several large-scale macroeconometric models of the U.S. economy. For example, while I was at The WEFA Group, I greatly expanded the scale and scope of the WEFA Long-Term Annual Model. The original model included 850 variables and, under my direction, it was expanded to include 2,300 variables. These changes introduced a detailed energy sector, an extensive demographics sector, and a producer prices sector. Also, the basic model design was altered to make it more useful for long-term forecasting and analysis. This work was done under research contracts with the U.S. Department of Energy, the Electric Power Research Institute, and Ross Laboratories.

The various professional positions I have held since leaving graduate school have all involved extensive model design, development, evaluation, and application. Shortly after leaving graduate school, I was named Resident Principal Investigator for the Brookings Quarterly Model Project of the U.S. Economy. This project involved developing a large-scale econometric model of the U.S. economy which incorporated state-of-the-art research by participating academic researchers. My role was to integrate the research done on specific aspects of the U.S. economy by these experts into a cohesive forecasting and analysis model. After leaving the Brookings Institution, I joined The WEFA Group which, at that time, was a non-profit research company wholly owned by the Trustees of the University of Pennsylvania. WEFA's objective was to do state-of-the-art econometric modeling research for both government and private sector clients. During my 16 year stay at WEFA, I was involved in a wide range of modeling projects and, from 1983 through 1987, was in charge of research and development for the entire company which led to my involvement in all the significant modeling projects performed by WEFA, including the development of a model of the world economy.

II. Evaluation of Dr. Besen's Modeling Approach

A. Overview

This section of my study focuses on the problems with the model design employed by Dr. Besen and also with the specific data he chose to use to estimate his model. The next section addresses the statistical (regression) problems that Dr. Besen did not properly consider. Before going into the specifics of Dr. Besen's model design, I discuss what is involved in developing a proper model specification and in identifying the proper data to use to estimate the coefficients (parameters) of the model.

This general context provides a useful background for evaluating what Dr. Besen has done and also helps one understand the problems with what Dr. Besen has done.

B. The Correct Analytical Approach

To properly perform an econometric analysis, one must employ both economic theory and statistical methods (such as regression methods). The critical first step in any successful econometric modeling effort is to specify the behavioral hypothesis that you are testing. Essentially, you must specify whose behavior you are modeling and the objectives of that economic actor. You may be able to readily translate such objectives into a regression model specification based on the existing body of published economic research. For example, there is no need to derive the regression model specification for consumer spending from basic principles because the economic literature contains many examples of what a demand equation should look like assuming that the consumers' objective is to maximize their satisfaction subject to a budget constraint. Even when the published literature does not provide you with a specific functional form, this literature usually provides general guidance. In any case, one can always go back to basic economic principles to develop a model specification. Dr. Besen identifies the decision maker and the objectives of the decision maker, but he fails to properly work through the implications of the behavior implied by these objectives in developing his model. Most importantly, he makes an improper simplifying assumption based on an incomplete and ultimately incorrect assessment of the market situation.

C. Dr. Besen's Modeling Approach

The objective of Dr. Besen's study is to determine the relative value to the cable system operator of each type of programming carried on distant signals. Dr. Besen argues that these relative values to the cable system operator should be used to

apportion the copyright royalty fees paid by cable system operators among the programming types. Dr. Besen considers only four programming types: (1) local (which is intended to cover the station originated programs represented by NAB); (2) devotional; (3) sports; and (4) movies/series. Dr. Besen omits PBS programming and Canadian originated programming. As a result, his estimated shares of royalty fees purport to be shares in the amount remaining after the amounts due to PBS programming and to foreign originated programming are ascertained by other means.

Before considering how these relative programming values are determined, it is constructive to examine how the royalties are determined. The royalties for a given cable system in a given period, t , are calculated by using the following formulas:

$$(\text{Royalties})_t = (\text{RoyaltyRate})_t * (\text{Revenues})_t \quad (1)$$

where

$(\text{Royalties})_t =$ Royalty fees paid in dollars by a Form 3 cable system for carrying distant signals in period t .

$(\text{RoyaltyRate})_t =$ Royalty rate expressed as a percentage of relevant revenues in period t . For Form 3 cable systems, this royalty rate increases as the number of distant signals carried increases. The amount of increase per additional distant signal varies by cable system, depending on the number of distant signals already carried and on the number of "permitted" distant signals for that cable system.¹

¹ The royalty rates paid by a given cable system depend on the number of "distant signal equivalents" ("DSEs") carried. Each independent distant signal has a value of one DSE, each distant network affiliate or educational station has a value of one-quarter of a DSE, and each Canadian or Mexican station has a value of one DSE. The percentage royalty rate paid depends on the number of DSEs. The royalty rate

$(\text{Revenues})_t =$ Relevant revenues in dollars of the cable system in period t . The relevant revenues include all of the subscription fee revenues for all tiers of service offered by the cable system that include at least one local or distant broadcast signal, including fees for additional set connections and converters.

In turn, the revenues for the given cable system period t are calculated using the following formula.

$$(\text{Revenues})_t = (\text{SubscriptionPrice})_t * (\text{Subscribers})_t \quad (2)$$

where

$(\text{SubscriptionPrice})_t =$ The average per subscriber charge in dollars for all cable services identified above in the definition of revenue.²

$(\text{Subscribers})_t =$ The number of subscribers to the cable system in period t .

for the first DSE is 0.893%. The minimum royalty rate for a cable system is 0.893% even if it carries no distant signals. Therefore, a cable system would generally be expected to carry at least one DSE (e.g., one distant signal) because it would pay for one in any case. The rate for the second, third and fourth DSEs is 0.563% per DSE. The rate for each DSE in excess of four is 0.265%. Therefore, if a cable system carried five DSEs (e.g., five distant independent signals), the royalty rate would be 2.847% (0.893 + 3 times 0.563 + 0.265). However, there is a marginal rate of 3.75% per DSE if the number of DSEs exceeds a number that tends to be specific to the given cable system and is related to the number of DSEs carried historically. There are also certain default rules based on the size of the television market in which the cable system is located. Suppose that a cable system were "permitted" under the rules to carry two independent stations. If that cable system already was carrying two independent stations, its royalty rate would be 1.456%. If that cable system chose to add a third independent station, the incremental royalty rate for this distant signal would be 3.75% and not 0.563%. Therefore, the cost of an additional distant signal to one cable system now carrying two independent stations could be 0.563% (if it were "permitted" to carry 3 independent stations) and would be 3.75% otherwise.

² As a practical matter, this data item would be calculated as relevant revenues divided by the number of subscribers.

The above formula for revenues can be substituted into the royalty formula producing an expanded royalty formula as follows:

$$(\text{Royalty})_t = (\text{RoyaltyRate})_t * (\text{SubscriptionPrice})_t * (\text{Subscribers})_t \quad (3)$$

Dr. Besen asserts that he has "controlled" for all the factors other than distant signal program value that affect revenues and thereby royalties by analyzing the change in royalty payments only in the periods following a change in the distant signal offerings of a cable system. The only way he could have "controlled" for the influence of other changes in programming, however, would have been to limit his analysis to those instances where the only change in signal offerings was the change in distant signals offered.³ In the typical constrained channel environment, most cable systems don't have unused channels. Therefore, if a distant signal is added, some other signal would be dropped. Conversely, if a distant signal is dropped, some other service (e.g., a local station or a cable network) would be added. Dr. Besen does not identify these related drops and adds in his analysis of the cases where a distant signal was added or dropped.

The 208 changes in distant signal offerings analyzed by Dr. Besen can be classified into cases involving only additions of distant signals, cases involving only drops of distant signals, and cases involving swaps of distant signals where there are both drops and adds of distant signals. In the latter case, the adds and drops need not exactly offset each other (e.g., there could be 2 drops and 1 add or 1 drop and 2 adds).⁴ The number of cases in each of these three categories is as follows:

³ There are factors other than programming which affect revenues, such as changes in the number of homes passed by the cable system and changes in the economic and demographic conditions within the community served by the cable system, for which Dr. Besen's approach also does not control.

⁴ In the case of Dr. Besen's database, there is only one case where the swaps are not balanced.

| <u>Distant Signal Change Cases</u> | <u>Number of Cases</u> |
|--|----------------------------|
| Adds | 33 |
| Drops | 141 |
| <u>Swaps</u> | <u>34</u> |
| Total | 208 |

Therefore, in at least 174 of the 208 cases analyzed by Dr. Besen, there was likely to have been at least one other change in the cable system's signal offering that was not accounted for by his analysis. For all cases, including the 34 swaps, there also could be other unaccounted for changes in channel offerings.⁵

Further, changes in the cable system's offerings unrelated to the change in the mix of distant signals offered are likely to occur at the same time the change in distant signals occur. Cable system operators tend to make changes infrequently, perhaps once or twice a year at most. It is likely also that the changes in the nondistant signal offerings of the cable system are made taking into account the changes in program type offerings that occur as a result of the distant signal change (e.g., a distant signal is dropped that shows a lot of older movies and is replaced with an all older movies cable network such as AMC). Also, the effects of earlier changes in cable system programming are likely to continue to affect cable subscriptions and revenues beyond the six-month period during which the change was made. For example, a cable system could add a number of cable network services on January 1st of a given year and continue to see an increase in the number of subscribers due to this change during the six month period beginning July 1st of that year. Further, the cable system might introduce new cable network services on January 1st and implement a subscription

⁵ Even when a cable operator adds a distant signal as part of a channel expansion, the operator is apt to add other nondistant signal services at the same time.

price increase on July 1st after it was confident that its subscribers saw these new channels as offering a significant positive benefit.

Conceptually, one can measure the service provided by various channels carried on a cable system in terms of the number of hours of different types of programming that are provided on the distant signal. For example, two different distant signals could be put on a common footing by describing these signals in terms of the number of hours of local, devotional, sports, and movies/series programming each offers. Under this approach, two distant signals that offered the same number of hours of each programming type would be considered identical.

Dr. Besen incorrectly argues that these hours of programming should be weighted by relative national viewing. Such weighting distorts the actual program content of the distant signal, since it has the effect of treating a distant signal as containing more hours of movies/series programming than it actually does. Also, using this relative national viewing data to weight the hours of programming on a given local cable system also fails to account for the market conditions the cable operator actually faces. Local tastes can differ from national tastes, and the existing mix of competing programming available on the cable system may already provide subscribers with all the programming of the type that is most widely viewed. Further, and more importantly, this weighting presumes that only the most heavily-viewed programming is of interest to a cable system's subscribers. While viewing hours are critical to broadcast networks and to broadcast stations because their advertising revenues are directly affected, the cable operator's revenues are not similarly affected. The cable system operator's revenues come primarily from subscriber fees. The objective is to provide a unique and valuable service to as many people as possible to attract and retain as many subscribers as possible. Less watched programming may not already be available on the cable system and may thus draw new subscribers to the cable system. Carried to its logical extreme, Dr. Besen's weighting scheme would

suggest that the cable system should carry the currently most popular network (NBC) on every channel.

The objective of Dr. Besen's regression analysis is to determine the relative value to the cable operators of the various types of programming carried on the distant signals. Weighting actual hours of programming by national viewing arbitrarily preassigns a higher weight to the programming types that are more heavily viewed nationally. Such national weighting may have no relationship to the value assigned to these programming types by the local cable system operators. In any case, such predetermined "value" weighting is inappropriate in view of the fact that the regression model is intended to be used to determine the relative value assigned to each programming type by the local cable operator.

III. Dr. Besen's Model Estimation Problems

A. Overview

Dr. Besen's model specification has serious conceptual problems which were discussed in the previous section. Dr. Besen's model is misspecified in several senses. First, Dr. Besen does not control for the effects of changes in factors other than the cable system's distant signal program offering which affect a cable systems' revenues and thereby the amount of royalties paid. The model estimation problem caused by this failure to control for the effects of changes in these other factors is model misspecification in the sense that additional important explanatory factors are omitted from the model. These omitted explanatory factors include the other changes in program offerings by type, particularly those related to changes in nondistant signal offerings, and also changes in cable system size which could increase the number of subscribers and revenue (for example, because the cable system has been expanded to pass more homes or because more homes are built in areas already served by the cable

system), and changes in the economic and demographic conditions within the communities the cable system serves.

Dr. Besen's model also is misspecified in the sense that it cannot logically be stated in percentage change terms given that Dr. Besen assigns a relative dollar value interpretation to the regression model's estimated coefficients. There is no reason to believe that the dollar value shares are strictly proportional to Dr. Besen's regression coefficients. Nevertheless, Dr. Besen makes the unsupported assumption of exact proportionality.

While both these misspecification problems make Dr. Besen's regression results unreliable, they are compounded by a third problem, which is referred to in the econometric literature as multicollinearity. The multicollinearity problem stems from the existence of a strong correlation between two or more of the explanatory variables. In the case of Dr. Besen's model, these explanatory factors are the percentage change in hours of local, devotional, sports and movies/series programming on the distant signals. Correlations exist between the percentage changes in the hours of movies/series and local programming and between the percentage changes in the hours of sports, devotional and movies/series programming. The strength of the correlations among these explanatory variables is not particularly high in an absolute sense, but they are high relative to the strength of the correlation between all the explanatory factors (i.e., the percentage change in hours of the four types of programming carried on the distant signals) and the dependent variable in Dr. Besen's model (i.e., the percentage change in royalties). The relatively weak correlation between the explanatory factors and the dependent variable, in turn, is probably due to the omission of the many other factors that would be expected to affect revenues and thereby royalties.

B. Dr. Besen's Regression Results

The estimated values for the coefficients in Dr. Besen's model⁶, along with their 95% confidence intervals, are as follows:

| Explanatory Factor: %Δ in Programming Hours: | Estimated Coefficient | 95% Confidence Interval | Is Coefficient Statistically Different From Zero? |
|---|--------------------------|----------------------------|---|
| Local | -0.0138 | ±0.0648 | No |
| Devotional | -0.0025 | ±0.0208 | No |
| Sports | 0.0774 | ±0.0907 | No |
| Movies/Series | 0.8628 | ±0.2621 | Yes |

The R-squared estimates for this model are 0.3133 uncorrected for degrees-of-freedom and 0.2997 corrected for degrees-of-freedom (the latter measure is often referred to as the adjusted R-squared or R-bar squared). The adjusted R-squared provides a more accurate estimate of the percentage of the variance in the dependent variable explained by the model.

Dr. Besen's regression model thus explains only 30% of the variance (changes) in the royalties dependent variable, and leaves 70% of the variance unexplained. This result confirms the fact that Dr. Besen did not control for the other important factors which affect royalties. These other factors which Dr. Besen has omitted from his model easily could account for a greater percentage of the variance in the dependent variable ($\Delta(\text{Royalties})$) than is accounted for by the factors that Dr. Besen did consider.

A low R-squared statistic often indicates that it will be difficult to estimate the regression coefficients with sufficient precision. The estimated regression coefficients

⁶ The model is described mathematically in Attachment 2.

will have wide confidence bands and, as a result, the estimated coefficients may not be close to their "true" unknown values.

Dr. Besen's estimated model exhibits a great deal of imprecision for the estimated regression coefficients. The 95% confidence interval for the estimated regression coefficients on the local, devotional and sports programming all include zero. Therefore, based on Dr. Besen's regression, one could not reject the hypothesis that these three individual coefficients are zero. In non-statistical terms, this result indicates that these three programming types separately have no positive value to the cable operator. In fact, one cannot reject the hypothesis that the coefficients on all three of these explanatory variables are simultaneously zero. Such a result suggests that the cable operator would be better off if all the distant signals carried only movies and series and no local, devotional or sports programming.

Dr. Besen does not recommend zero value shares for local, devotional or sports programming. He recommends small but positive shares for these three categories based on an arbitrary ad hoc adjustment to the regression estimates of these shares.⁷ However, his regression results suggest that the entire value of the distant signal is due to its movies/series programming. This result makes no sense. If only movies and series had value, why would cable operators add distant signals that offered substantial amounts of other types of programming? Further, given that there are cable network signals that do provide only movies and series, why would the cable operator carry distant signals that offered substantial amounts of programming other than movies and series? Instead, the cable operator could substitute a cable network service to get greater value out of the limited number of cable channels available. Finally, if the cable operators only wanted movies and series from their distant signal offerings, why do all

⁷ Dr. Besen assigns a positive share value to local and devotional programming equal to the upper end of the 95% confidence range for the regression coefficients on these two programming categories. The share values for the sports and movies/series programming categories are set to their positive estimated coefficient values. These values are then scaled to sum to one.

the most commonly carried distant signals provide substantial amounts of other types of programming? The fact that Dr. Besen's results are so clearly inconsistent with what is observed in the cable marketplace itself raises serious questions about the data and analytical methods he has employed.

C. Identifying Dr. Besen's Specific Estimation Problems

1. Model Misspecification

Dr. Besen's attempts to reduce the complex problem of assigning relative values to the various types of programming carried on distant signals to a simple single equation model have not been successful. First, the royalties paid by the cable operator for distant signals depends on more than the hours of programming carried on these distant signals. Dr. Besen has failed to control for the effects on cable system revenues of other relevant factors. This failure is due not only to the fact that other unmeasured changes in the program content of the cable system are occurring when there is a change on the cable system's distant signal offering, but also because the value of the program type content of a given distant signal depends on the program content of all the other signals concurrently carried by the cable system. For example, the value of 100 additional hours of sports programming over a six-month period due to a change in distant signal offerings depends on how many hours of sports programming are available from the other signals carried by the cable system. If these other signals already provided 1,000 hours of sports programming, the additional 100 hours of sports programming would be worth less than if these other signals provided only 200 hours of sports programming.

The only way to control for the other programming that is available on a cable system is to explicitly take this programming content into account when determining

the relative value of the various types of programming available on the distant signals. Dr. Besen has not done so.

2. Sample Selection

Dr. Besen's sample of 208 observations of changes in cable system distant signal carriage is not randomly drawn from the population of cable systems. Instead, the cable systems included in his sample are limited to those that carried only distant signals for which MPAA provided programming information. This information was available only for a nonrandom and nonrepresentative group of stations selected by MPAA. As a consequence of this nonrandom sample, the results obtained by analyzing this sample can not be extrapolated to the population of cable systems. Therefore, even if the other problems with the analysis could be overcome, the relative value share estimates generated for this sample would not be valid estimates of the relative value shares for the population of cable systems.

3. Measurement Problems

The hours of programming measure should be the unweighted (actual) hours of programming available by type on each distant signal. Dr. Besen reran his regression using the percentage change in unweighted (actual) hours of programming by type. Since I believe that actual hours of programming by type are a more appropriate measure of the programming content of these distant signals than the weighted hours used by Dr. Besen, I will present the remainder of my evaluation in terms of the problems with this version of Dr. Besen's model.⁸ I have verified that all the problems and solutions identified for this version of the model also apply to the version using weighted data.

⁸ The unweighted (actual) hours model is described mathematically in Attachment 3.

The estimated model coefficients for Dr. Besen's model when actual programming hours data are used, along with the 95% confidence intervals, are as follows:

| Explanatory Factor: %Δ in Programming Hours: | Estimated Coefficient | 95% Confidence Interval | Is Coefficient Statistically Different From Zero? |
|---|--------------------------|----------------------------|---|
| Local | -0.0139 | ± 0.1016 | No |
| Devotional | 0.0309 | ± 0.0740 | No |
| Sports | -0.0076 | ± 0.1925 | No |
| Movies/Series | 0.9016 | ± 0.3663 | Yes |

The R-squared for this estimated model is 0.3136 and the adjusted R-squared is 0.3001. While the actual hours data are conceptually more appropriate to use than the weighted hours, the misspecification and collinearity problems (to be discussed below) are still present, making the model results weak and implausible. The model still only explains 30% of the variance in the dependent variable. The estimated regression coefficients on local, devotional and sports programming are separately and collectively not statistically distinguishable from zero, implying again that all the value in the distant signal is due to its movies/series programming. When actual programming hour data are used, the 95% confidence range for Dr. Besen's regression model coefficients is even wider than when the weighted programming hour data are used. However, the strength of the relationship between the percentage changes in programming hours and the percentage change in royalties is virtually identical.

4. Multicollinearity Among The Explanatory Factors

Multicollinearity results when two or more of the explanatory variables in a regression model are relatively highly correlated. As will be demonstrated below,

among the explanatory factors used in Dr. Besen's model specification, there is a relatively strong correlation between the percentage change in movies/series programming hours and the percentage change in local programming hours. Also, there is a somewhat weaker correlation between the percentage change in devotional programming hours, the percentage change in sports programming hours, and the percentage change in movies/series programming hours.⁹

One can observe symptoms (or manifestations) of multicollinearity based on the results of Dr. Besen's analysis alone. These include obviously incorrect signs on the estimated coefficients (e.g. the estimated negative values for the relative values shares of the three programming types other than movies/series)¹⁰, the implausibility of the relative magnitudes of the estimated regression coefficients (e.g. the apparent result that only movies and series programming have a positive (non-zero) value to cable operators), and the very high size of the confidence bands on the estimated coefficients.

The existence of these symptoms does not prove that there are multicollinearity problems. It is possible that such symptoms indicate only that the model specification is incorrect or incomplete. Since the model is misspecified, the apparent multicollinearity problem, at least in part, could be due to this misspecification. However, while misspecification serves to make the regression results more sensitive to multicollinearity than would otherwise be the case (i.e. multicollinearity problems arise when the correlation among the explanatory variables is only moderately strong), multicollinearity clearly is present and is part of the problem.¹¹ Moreover, unlike the

⁹ This second correlation is stronger for the percentage change in actual programming hours than is the case for the percentage change in weighted programming hours.

¹⁰ In the two estimates of Mr. Besen's model (using weighted and actual programming hours), the estimated regression coefficients for local, devotional, and sports were negative in at least one of the two cases.

¹¹ The interaction of misspecification and multicollinearity was evaluated in C. Thiart, T.T. Dunne, C.G. Troskie, and D.O. Chalton, "A Simulation Study of Biased Estimators Against the Ordinary Least Squares Estimators," Communications In Statistics, Vol. 22, No. 2, 1993, pp. 569-589. Their results

effects of misspecification, which cannot be eliminated in this case without performing an entirely new study, some sense of the impact of the multicollinearity can be obtained through a reanalysis of Dr. Besen's data, as discussed below.

D. Documenting the Presence of Multicollinearity

1. Causes of Multicollinearity

Usually there is some degree of correlation between the explanatory variables in a regression model. However, such correlation typically is weak and is due to happenstance. In other cases, the correlation can be strong. In some cases, there is a logical reason for such strong correlation (e.g. it is logical that when one explanatory factor changes that another explanatory factor would change in a roughly predictable fashion). In other cases, the strong correlation may be due to many repetitions of the same set of changes (e.g. the same distant signal may be added by or dropped by a large number of the cable systems and the mix of distant signals offered by these cable systems tends to be very similar). This last case appears to be part of the problem with Dr. Besen's database. The correlation among the explanatory variables is not perfect (i.e. there is not an exact linear relationship between these explanatory factors) but the correlation appears to be sufficient in the database for the 208 cable systems used by Dr. Besen to cause the multicollinearity symptoms discussed above.

2. "Tests" for Multicollinearity

There are no formal statistical tests which can be performed to establish precisely that multicollinearity is present to a sufficient degree among the explanatory variables in the model to cause the various problems that are symptomatic of multicollinearity.

showed that when a model's R-squared was low that moderately strong multicollinearity could cause estimation problems.

Instead, there are "rules-of-thumb" which serve to indicate the likely presence or absence of multicollinearity.¹² However, there is a formal statistical test to establish whether the combination of misspecification and multicollinearity present in a given modeling exercise are sufficient to render the model's coefficient estimates unreliable.¹³

What constitutes relatively strong collinearity between the explanatory variables depends on the strength of the correlation between the explanatory variables and the dependent variable. If there is a strong correlation between the explanatory variables and the dependent variable, then a relatively high correlation between the explanatory variables may not cause the types of problems that are symptomatic of multicollinearity. On the other hand, if the correlation between the explanatory variables and the dependent variable is relatively weak (which is the case for the Besen model), then a relatively weak correlation among the explanatory variables may cause the multicollinearity symptoms to occur.

The "rule-of-thumb" that contrasts the relative strength of the correlation among the explanatory variables with the correlation between these explanatory variables and the dependent variable was developed by Professor Lawrence R. Klein, of the University of Pennsylvania.¹⁴ This test requires that auxiliary regressions be estimated where each explanatory variable is regressed on all the other explanatory variables. The R-squared statistic for each such auxiliary regression (i.e. each auxiliary R-squared) is then compared to the R-squared for the equation being estimated (here, the R-

¹² The methods used to detect multicollinearity are discussed in William H. Greene Econometric Analysis: 2nd Edition, MacMillan Publishing Company, New York, 1993, pp. 266-273 (hereinafter Greene). A somewhat more intuitive discussion is provided in Damodar N Gujarati, Basic Econometrics: 3rd Edition, McGraw Hill, Inc., New York, 1995, pp. 319-346 (hereinafter Gujarati).

¹³ See David A. Belsley, Conditioning Diagnostics: Collinearity and Weak Data in Regression, John Wiley & Sons, New York, 1991, pp. 205-244 (hereinafter Belsley).

¹⁴ This "rule-of-thumb" test is discussed by both Greene and Gujarati. The test was originally developed in Lawrence R. Klein An Introduction to Econometrics, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1962, pp. 62-64 and p. 101 (hereinafter Klein).

squared for the regression of the percentage change in royalties on the percentage changes in programming hours by type). Klein's rule-of-thumb states that multicollinearity can be expected to be a problem when one or more of the auxiliary R-squares are close to or larger than the R-squared for the equation being estimated. Intuitively, one suspects that the likelihood of multicollinearity problems would increase as the number of auxiliary equations with relatively high R-squareds increased and also when the size of the auxiliary R-squareds increased relative to the overall equation R-squared. The auxiliary R-squareds are as follows:

| Auxiliary Regressions of the Given Explanatory Variable on all the Other Explanatory Variables. | Auxiliary R-Squared |
|---|---------------------|
| Constant (Intercept) | 0.3928 |
| Local | 0.6218 |
| Devotional | 0.3779 |
| Sports | 0.4655 |
| Movies/Series | 0.7391 |

The R-squared for the Besen model equation is 0.3136. There thus is evidence of potential multicollinearity problems between all of the explanatory variables, since all the auxiliary R-squareds are larger than the Besen equation R-squared. The strongest correlation among the explanatory variables is between the percentage change in local programming hours and the percentage change in movies/series programming hours. There also is a weaker correlation between the devotional, sports and movies/series percentage changes in programming hours variables. The auxiliary R-squared rule-of-thumb test suggests a strong likelihood of multicollinearity problems.

A second set of more complex and formal tests for multicollinearity also were performed. These tests involve the auxiliary R-squared analysis discussed above as

well as a condition index analysis.¹⁵ This formal test evaluates the “signal-to-noise” ratio for each model coefficient to determine whether the “noise” caused by multicollinearity is sufficient, given the overall strength of the relationship between the dependent variable and the explanatory variables, to make the collinearity problems harmful in the sense that one can expect to observe the symptoms of multicollinearity.¹⁶

The results of the formal signal-to-noise tests are presented in Attachment 4. The results of the tests indicate that collinearity poses a potential problem for the reliability of all the coefficients in the Besen model, and, in the situation where it is important to accurately estimate the coefficients which would be the case in the current context, there is an inadequate signal-to-noise ratio for all of the model’s coefficients. This formal test confirms the problems suggested by Klein’s rule-of-thumb test.¹⁷

E. Implications of Multicollinearity

1. The Effect On The Estimated Model Coefficients

The presence of multicollinearity does not imply the coefficients estimated using ordinary least squares regression (which is used by Dr. Besen and here) will be biased but instead that the variance of the estimated coefficients will be very large. While the absence of bias is “good”, it doesn’t suggest that coefficients estimated in the presence of multicollinearity will provide useful information regarding the true value of the

¹⁵ The condition index analysis is described in Greene and Gujarati. The condition index analysis was developed by D.A. Belsley, E. Kuh and R. Welsch, Regression Diagnostics: Identifying Influential Data and Sources of Collinearity John Wiley & Sons, New York, 1980, pp. 85-91 (hereinafter Belsley et al.)

¹⁶ These tests described in Belsley, pp. 205-244. This book expands upon and extends the analysis presented in the book by Belsley et al.

¹⁷ The Besen model data do not fail the condition index rule-of-thumb test originally developed in Belsley et al., but do fail the more formal signal-to-noise test developed by Belsley.

unknown model coefficients (i.e., the actual contribution of each category of programming to the value of the distant signal purchased by the cable operator).

To illustrate this point, consider the unknown true model coefficient on the explanatory variable for movies/series programming (A_m) in Dr. Besen's regression model specification.¹⁸ Based on the actual programming hours data, the ordinary least squares regression estimate of this model coefficient (A_m^{est}) is 0.9016. Even though the database used to generate this estimate has severe multicollinearity problems, the expected value of this regression estimate equals the true unknown value of the model coefficient A_m (denote this true expected value as A_m^*).

However, this lack of bias is not meaningful in the presence of severe multicollinearity. The fact that the estimate of A_m (A_m^{est}) equals 0.9016 and that the expected value of (A_m^{est}) equals the true unknown value of A_m (A_m^*) does not suggest that A_m^* need be anywhere close to 0.9016. All that is known about A_m^* is that one has 95% confidence that it will fall within the 95% confidence range around (A_m^{est}).

Multicollinearity causes the variance of (A_m^{est}) to be high and thereby the 95% confidence range around (A_m^{est}) to be very wide. Being able to say with 95% confidence that the coefficient on the movies/series variable, A_m^* , falls somewhere between 0.535 and 1.268 does not convey much, if any, useful information. Therefore, the fact that model coefficients estimated using ordinary least squares in the presence of

¹⁸ See the mathematical statement of the model in Attachment 3.

multicollinearity are unbiased does not suggest that such estimates will be useful. Further, in the case of Dr. Besen's model, the problems of multicollinearity are compounded with the problem of misspecification. As a result, one cannot have 95% confidence that the movies/series coefficient falls even within the very wide range.

2. Illustrating the Implications of Multicollinearity

The presence of serious multicollinearity implies that the estimates of the regression coefficients are highly sensitive to relatively small changes in the database used to estimate the model. I have performed two experiments to illustrate the extreme sensitivity of the coefficient estimation results for the Besen model to changes in the data sample used to estimate the model's coefficients.

a. Form 3 Systems Only

Dr. Besen intended to estimate his model using only data for Form 3 cable systems. However, Dr. Besen included in his potential sample all cable systems that were Form 3 systems at any time during the time period covered by his analysis. Some of the cable systems were Form 2 systems during part of this period. It would be logical to restrict the regression analysis to include only the observations when the given cable system was a Form 3 system both before and after the change in distant signal offerings. Dr. Besen's original sample included 208 observations. Restricting his sample to include only observations for cable systems that were Form 3 before and after the change in the number of the distant signals offered reduces the number of observations in the sample to 178 (i.e. it eliminates 30 observations). Dr. Besen states that he estimated his equation using the sample including only these 178 observations and obtained share estimates that were "generally consistent with the results reported in the text [i.e. based on the 208 observations]." (See Besen, p. 27, f.n. 43).

The two sets of regression estimates obtained using actual programming hours data are as follows:

| | FORM 3 ONLY (178) | | ALL OBSERVATIONS (208) | |
|------------------------------------|-----------------------|-------------------------|------------------------|-------------------------|
| % Change in Programming Hours For: | Estimated Coefficient | 95% Confidence Interval | Estimated Coefficient | 95% Confidence Interval |
| Local | 0.0740 | ± 0.1122 | -0.0139 | ± 0.1016 |
| Devotional | -0.0355 | ± 0.0770 | 0.0309 | ± 0.0740 |
| Sports | 0.1201 | ± 0.2007 | -0.0076 | ± 0.1925 |
| Movies/Series | 1.1868 | ± 0.3682 | 0.9016 | ± 0.3663 |

The R-squared for the model estimated on the Form 3 sample is 0.4746 while the R-squared for the model estimated using all of Dr. Besen's original sample is only 0.3136. A simple inspection indicates that the differences between the two sets of estimated coefficients are not trivial.

The 95% confidence ranges for these two sets of estimates are as follows:

| | FORM 3 DATA ONLY | | ALL OBSERVATIONS | |
|---------------------------|--------------------|--------------------|--------------------|--------------------|
| Relative Value Share For: | Lower-End of Range | Upper-End of Range | Lower-End of Range | Upper-End of Range |
| Local | -0.038 | 0.186 | -0.116 | 0.088 |
| Devotional | -0.113 | 0.042 | -0.043 | 0.105 |
| Sports | -0.081 | 0.321 | -0.200 | 0.185 |
| Movies/Series | 0.819 | 1.555 | 0.535 | 1.268 |

Based on the Form 3 data only, the upper-end of the range for the coefficient is 0.186 versus only 0.088 when all the observations are used (i.e. when the Form 2 systems are included). Secondly, based on the Form 3 data only, the sports coefficient could be as

large as 0.321 versus only 0.185 when the Form 2 systems also are included. Also, the movies/series coefficient could be substantially greater than 1.0.

b. Randomly Selected Subsamples

If the regression coefficients estimates developed using the original 208 data points were stable, one would expect that the coefficient estimates generated by a subset of this database also would be stable. One way to test for coefficient estimator stability is to randomly subdivide the sample of 208 observations into two exhaustive subsamples, each with 104 observations.¹⁹ Then the Besen model coefficients can be estimated for each subsample. While one would expect some degree of variation in the estimated coefficients for these subsamples, if the coefficient estimates are stable, this variation should not be extreme.

Attachment 5 presents the distribution of coefficient estimates for the Besen model generated from 18 subsamples with an average of 104 observations each²⁰ (i.e. the sample was subdivided into two exhaustive subsamples 9 times). The estimated values for the four shares cover a wide range, as shown below:

¹⁹ This subdivision is done by randomly assigning either the number 1 or 0 to each of the 208 observations and then placing those observations with a "1" in the first subsample and those with a "0" into the second subsample.

²⁰ Because of the random nature of the subdivision of the full sample of 208 observations, there can be slightly more or less than 104 observations in any given subsample.

| | Range of Estimated Coefficients Generated from 18 Randomly Selected Subsamples | |
|-------------------------------|---|---------------|
| Estimated Coefficient For: | Minimum Value | Maximum Value |
| Local | -0.2242 | 0.1517 |
| Devotional | -0.0368 | 0.1314 |
| Sports | -0.2133 | 0.2605 |
| Movies/Series | 0.5118 | 1.3796 |

The coefficient estimates generated for these subsamples are not stable.

F. Circumventing The Multicollinearity Problem

1. Overview

Ideally, one would want to “fix” the multicollinearity problem in Dr. Besen’s data and then generate accurate relatively stable estimates of Dr. Besen’s model’s coefficients. Unfortunately, there are no “cures” for multicollinearity problems within the context of a given database. A true “cure” for the multicollinearity problem would require the collection of additional data which don’t have multicollinearity problems. In the case of Dr. Besen’s dataset, for example, a sample of randomly selected cable systems, rather than Dr. Besen’s nonrandomly selected sample, might not exhibit multicollinearity problems.²¹

²¹ Unfortunately, such a “fix” would be time-consuming and expensive, and would not even address the serious misspecification problems with Dr. Besen’s model design. Fixing the misspecification problems would require a model design that incorporated all the factors that significantly affect cable system revenues and data for all these factors. Such a task is far beyond the scope of this study.

Instead of a true "fix", the best that can be done given that one is limited to using the existing Besen database is to circumvent, or in some sense, work around the multicollinearity problem. In essence, the regression approaches that have been developed to cope with multicollinearity attempt to filter out the "noise" in the data caused by multicollinearity so that the "signal" that is hidden, or distorted, by the "noise" can be identified. While such an alternative regression method can succeed in identifying a "signal", the process which filters out the "noise" also can modify the "signal." Therefore, even though the estimated coefficients produced by an alternative regression method shown below are a-priori plausible, unlike the clearly incorrect results produced by Dr. Besen's ordinary least squares regression, they do not necessarily establish the unknown true values of these coefficients. However, these alternative regression estimates have a lower variance (i.e., are more stable) than those produced using ordinary least squares regression.

2. An Alternative Regression Method²²

The principal components regression method was applied to the Besen model using the database on actual rather than viewing-weighted programming hours.²³ A principal component is defined as a linear combination of the explanatory variables in the model.²⁴ There are as many principal components as there are explanatory

²² In this section, I present the results obtained using the principal components regression method. I also applied the ridge regression method which produced results that similarly demonstrate the inappropriateness of Dr. Besen's results.

²³ The principal components regression method is described in Greene, pp. 271-273. See also George Judge, W. Griffiths, R. Carter Hill, H. Lütkepohl and T. Lee, The Theory and Practice of Econometrics, 2nd Edition, John Wiley and Sons, 1985, pp. 909-912 (hereinafter Judge et al.).

²⁴ Principal components can be calculated either including or excluding the constant term. I have chosen to calculate them excluding the constant term.

variables. For the Besen model, there are four explanatory variables and four principal components.²⁵

The first principal component is defined so as to explain the greatest possible percentage of variation in the explanatory variables. In other words, it is the linear combination of the explanatory variables which is most closely correlated with these explanatory variables. The second principal component is also a linear combination of the original explanatory variables. However, it is subjected to the constraint that it be totally uncorrelated with the first principal component. Given this constraint, it is then defined to explain as much variation in the explanatory variables as possible. Alternatively, one can view the second principal component as explaining as much of the variation as possible in the explanatory variables after the variation explained by the first principal component is removed. The third principal component is defined to be uncorrelated with the previous two principal components while the fourth principal component would be uncorrelated with the first three principal components. Given these constraints, the third and fourth principal components are defined so as to explain the greatest percentage possible of the variance in the explanatory variables. When one has four explanatory variables, as is the case for the Besen model, these four principal components explain all the variation in the original four explanatory variables. A principal components regression run using the four principal components as explanatory factors would exactly reproduce the ordinary least squares (OLS) regression results obtained using the original four explanatory variables.

However, the objective is not to reproduce the OLS regression results but to use a subset of the principal components as explanatory factors to develop a plausible set of model coefficient estimates. In the case of the Besen model and database, such a set of plausible coefficient estimates is produced using just the first principal component.

²⁵ See Attachment 6 for a mathematical description of how the principal components are defined in terms of the original explanatory variables included in the Besen model.

Adding the second or third principal component did not statistically improve the equation's explanatory power. Therefore, the "best" principal component based regression result is produced using only one principal component.²⁶

Principal component regression is a form of constrained regression. Using the principal component's regression method is mathematically equivalent to performing constrained OLS regression. The principal components method essentially eliminates "noise" from the explanatory variables by imposing constraints on the estimated coefficients. Estimating the Besen model coefficients using one principal component is the same as estimating these components subject to three linear constraints. These constraints allow the "signal" to be identified. However, these constraints also modify the "signal."

The principal components regression method produces the lowest variance for the estimated model coefficients of any constrained regression method and a lower variance for the estimated coefficients than is obtained using the ordinary least squares regression method.²⁷ Therefore, there is less volatility in the principal component method coefficient estimates.

The principal component regression method results in estimated coefficients for all four of the Besen model's explanatory variables that are positive and sum to 0.6480.

²⁶ The degrees-of-freedom adjusted percentage of the variation in the dependent variable explained (i.e., the adjusted R-squared) with just one principal component was 26.7%. Adding the second principal component raised the adjusted R-squared to only 27.3% (not a statistically significant gain). Adding the third principal component reduced the adjusted R-squared to 27.0%. Therefore, the first principal component captured all the relevant variation from the explanatory variables that is contained in the first three principal components. Adding the fourth would simply reproduce the original flawed OLS regression results.

²⁷ See T. Fomby, R. Carter Hall and S. Johnson, "An Optimal Property of Principal Components in the Context of Restricted Least Squares," Journal of the American Statistical Association, March 1978, pp. 191-193; and E. Greenberg, "Minimum Variance Properties of Principal Component Regression" Journal of the American Statistical Association, March 1975, pp. 194-197.

The R-squared for this regression is 0.2674. (the R-squared for the OLS regression is 0.3136 while its adjusted R-squared is 0.3001.)

The principal components method estimates of the relative value shares (scaled to sum to 100%) are as follows:

| Relative Share Value For: | Estimated Share | t-Statistic | 95% Confidence Interval |
|------------------------------|--------------------|-------------|----------------------------|
| Local | 13.75% | 8.75 | $\pm 3.08\%$ |
| Devotional | 11.59% | 8.75 | $\pm 2.60\%$ |
| Sports | 31.28% | 8.75 | $\pm 7.01\%$ |
| Movies/Series | 43.38% | 8.75 | $\pm 9.72\%$ |

The t-statistic is used to test whether the estimated coefficients are statistically significant (i.e., whether the estimated coefficient is statistically different from zero). When the t-statistic is greater than 1.96, one is 95% confident that the estimated coefficient is different from zero.²⁸

The 95% confidence ranges for these share estimates generated using the principal component method are as follows:

²⁸ See Greene, pp. 58-59 and 160-162. Also, see Table 3 in the Tables Appendix to Greene.

| | 95% Confidence Range for Principal Components Method Results | |
|------------------------------|--|-----------------------|
| Relative Value Share For: | Lower End of Range | Upper End of Range |
| Local | 10.7% | 16.8% |
| Devotional | 9.0% | 14.2% |
| Sports | 24.3% | 38.3% |
| Movies/Series | 33.7% | 53.1% |

The Besen model coefficients estimated using the principal components method have a much narrower 95% confidence range than do the coefficients estimated using the OLS regression method.²⁹ While these results are certainly more reasonable than those produced by Dr. Besen, they still suffer from the serious misspecification problems of Dr. Besen's model design.

IV. Comparing The Bortz and Besen Studies

A. Overview

Mr. Bortz has submitted a survey-based study which provides estimates of the same relative value shares that Dr. Besen attempted to estimate in his study. As was demonstrated in the previous sections of this paper, Dr. Besen's database is plagued by multicollinearity problems which makes his estimates of the relative value shares highly unreliable (i.e., the confidence ranges around his estimated model coefficients are so wide that his results essentially are of no value). However, the principal component method produces estimates of the relative value shares that can be

²⁹ See Section III.C.3 above.

compared with the relative share values produced by Mr. Bortz using survey methods. The comparable relative value share estimates are as follows:

| Relative Value Share For: | Bortz 1992 Estimate ³⁰ | Principal Components Method |
|---------------------------|-----------------------------------|-----------------------------|
| Local | 12.4% | 13.8% |
| Devotional | 3.9% | 11.6% |
| Sports | 38.8% | 31.3% |
| Movies/Series | 41.6% | 43.4% |

I have reviewed the paper submitted by Mr. Bortz including the 1992 survey instrument used by the interviewers. The survey has been done properly from a survey design viewpoint. Given that the relative value shares produced by Mr. Bortz appear to have been properly estimated and that a 95% confidence interval has been provided for these estimates, it would be useful to combine Mr. Bortz's information on the relative value shares with the information on these same shares contained in Dr. Besen's database. The Bayesian regression method provides a means to combine these two pieces of information.

B. Bayesian Regression Methods

Bayesian regression methods³¹ provide a framework and methodology for formally combining information regarding the coefficients of a model from multiple sources. In the current context, the two studies that have produced estimates of the relative values to the cable system operators of the programming carried on distant

³⁰ The Bortz study also reports estimates values for PBS programming and Canadian programming. If the results are scaled so as to provide relative shares for only the four categories studied by Dr. Besen, the scaled 1992 Bortz estimates would be: Local 12.8%; Devotional 4.0%; Sports 40.1%; Movies/Series 43.0%.

³¹ Bayesian regression methods are discussed in Greene, pp. 255-260 and in Judge *et al.*, pp. 97-140.

signals are: (1) the Bortz study which generated relative share value estimates based on a random sample survey of 233 cable system operators; and (2) the Besen study which generated relative share value estimates based on regression analysis of a nonrandom sample of 208 observations of cable system data. The end result of the Bayesian regression analysis is a merged estimate of the relative value shares that incorporates the information from both sources.

Standard (non-Bayesian) regression methods generate estimates of the coefficients of a model based solely on the information contained in the data sample that is being used to estimate these coefficients (e.g., Dr. Besen estimated the coefficients in his model based solely on the information in his nonrandom sample of 208 observations). The Bayesian approach to regression analysis augments the standard approach by incorporating existing information regarding the values of the model coefficients. This existing information is referred to in Bayesian jargon as the prior information regarding the model coefficients or, more simply, as the "Bayesian prior." The information included in the "Bayesian prior" are the existing estimates of the values of the model's coefficients (e.g., Mr. Bortz's estimates of the relative value shares) and the degree of uncertainty regarding these estimated values (e.g., Mr. Bortz's 95% confidence intervals).

The Bayesian regression approach then uses conventional regression methods to produce a merged estimate (or in Bayesian jargon, the posterior estimate) of the model's coefficients. The regression computation simultaneously analyzes the data sample used by the standard regression approach to estimate the model's coefficients and the prior estimates of these coefficients and their associated confidence intervals.³² The merged (posterior) estimate of the model's coefficients are minimum variance

³² The computation method used here is a form of generalized least squares. See Henri Theil, Principles of Econometrics, John Wiley & Sons, New York, 1971, pp. 347-349 and pp. 670-672.

(best) unbiased estimates. These final estimates are determined implicitly by taking into account how well the prior coefficient estimates fit the data sample and also by taking into account the consistency of the coefficients generated by the standard regression method with the prior information. The stronger the standard regression method results are (i.e., the higher the R-squared is and the narrower the confidence intervals on the estimated coefficients are), the higher the weight given to the standard regression results in merging the two estimates. Conversely, the weaker the standard regression results are, the lower the weight given these estimates. A “relatively strong” prior estimate would have relatively narrow confidence intervals for the estimated coefficients and would be given relatively higher weight in the merged result.

C. Applying The Bayesian Regression Method

The information taken from the Bortz survey are the estimated relative value shares and the 95% confidence intervals for these estimates.³³ These relative value shares and their 95% confidence intervals are as follows:

Bortz Information Used
As Bayesian Prior

| Relative Value Share For: | Scaled Coefficient Estimate | 95% Confidence Interval |
|------------------------------|-----------------------------------|----------------------------|
| Local | 0.128 | ± 0.0174 |
| Devotional | 0.040 | ± 0.0065 |
| Sports | 0.401 | ± 0.0229 |
| Movies/Series | 0.431 | ± 0.0310 |

³³ These confidence intervals were calculated from the 95% confidence intervals provided by Mr. Bortz. Since only the four programming categories are being considered, the Bortz shares for these four categories are scaled the sum to 1.0. The corresponding confidence intervals are scaled using the same factor.

The results produced by the Bayesian regression method³⁴, scaled to sum to 1.0, are as follows:

Bayesian Posterior Results

| Relative Value Share For: | Coefficient Estimate | 95% Confidence Interval |
|------------------------------|-------------------------|----------------------------|
| Local | 0.124 | ± 0.0172 |
| Devotional | 0.040 | ± 0.0066 |
| Sports | 0.400 | ± 0.0232 |
| Movies/Series | 0.436 | ± 0.0312 |

The estimated relative value shares obtained by combining the information from the Bortz survey with the information in Dr. Besen's database are almost identical to the estimates generated from the Bortz study. This result suggests that Dr. Besen's data provide no basis for questioning the relative value share estimates from the Bortz survey. The RMSE statistic from the original Besen OLS regression was 0.5363. The RMSE statistic produced by the Bayesian regression method is 0.5641 (which is about 5% higher than the OLS regression RMSE statistic -- the OLS regression RMSE statistic is the smallest value that can be obtained.)

Put more intuitively, the Bortz relative value share estimates themselves, used as coefficients in the Besen model, do a good job of explaining the percentage change in royalties in the Besen database. Further, I have shown that the OLS regression estimates are estimated with great uncertainty (i.e., they have a very large standard error and thereby a very wide 95% confidence interval). Therefore, the alternative estimates of these relative value shares produced by applying OLS regression to the

³⁴ The computational method used to produce these estimates is described in Henri Theil, Principles of Econometrics, John Wiley & Sons, New York, 1971, pp. 347-349 and pp. 670-672.

Besen database are highly uncertain and therefore will be given little weight in determining the final (posterior) Bayesian regression method result.

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Docket No. 94-3 CARP-CD90-92

DECLARATION

I, George R. Schink, declare under penalty of perjury that the Rebuttal Statement of George R. Schink presented in the 1990-1992 Cable Copyright Royalty Proceeding is true and correct to the best of my knowledge, information and belief.



George R. Schink

Dated: Feb 15, 1996

Attachment 1

Resume Of George R. Schink

GEORGE R. SCHINK, Ph.D.

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EDUCATION

Ph.D., Economics, University of Pennsylvania, 1971.

Thesis (Unpublished): Small Sample Estimates of the Variance Covariance Matrix of Forecast Error for Large Econometric Models: The Stochastic Simulation Technique.
Won William Carey Prize for best Ph.D. thesis in economics at the University of Pennsylvania, 1971. Thesis Advisor: Professor Lawrence R. Klein

B.S., Economics, University of Wisconsin at Madison, 1964.

PRESENT POSITION

LAW & ECONOMICS CONSULTING GROUP, INC., July 1994 - present.
Principal

PROFESSIONAL EXPERIENCE

AUS CONSULTANTS, INDUSTRY ANALYSIS GROUP, West Conshohocken, PA, June 1988 - July 1994.

Chairman and Chief Executive Officer, June 1988 - July 1994.

Responsible for overall management and strategic guidance of the Industry Analysis Group, as well as the design and execution of consulting projects related to the automotive, energy, utility, and telecommunications industries. These projects include market analysis, development of sales volume and revenue models, development of price and cost models, industry studies, and analysis of the impact of government policy and regulatory changes on these industries. The results of these studies are provided to clients as reports and in direct presentations to senior management. Also, Dr. Schink has extensive experience in presenting testimony before regulatory bodies and in the courts.

THE WEFA GROUP (Wharton Econometrics), Bala Cynwyd, PA, June 1972 - May 1988.

Senior Vice President, Consulting Services, May 1987 - May 1988.

Vice President, Research and Development, June 1983 - May 1987.

Responsible for the development, enhancement, specification, maintenance of the

Wharton econometric models. Also responsible for design, execution, and economic content of large contract research projects, preparation and presentation of testimony, general quality control of Wharton economic analysis and forecasting products, internal training of economic staff, and design inputs for econometric and statistical software.

Key contract research projects include an analysis of the macroeconomic impacts of local content legislation and an analysis of the economy-wide effects of the FCC access charge plan. Major model development projects include a redesign of Wharton's multiregion model of New York State and respecification and updating of Wharton's Quarterly Model.

Vice President, U.S. Modeling Services, January 1980 - June 1983.

Responsible for coordinating model development/enhancement activities of Wharton's U.S. forecasting services, including the Long-Term Forecasting Model, the Quarterly Forecasting Model, and Industry Planning Service Model.

Worked with the marketing group and the model project directors to develop new sources of revenue for the U.S. model-based forecasting services from both subscription and contract research sources.

Executive Director, Wharton Annual (Long-Term)

Model Project, January 1977 - December 1979.

Responsible for directing model development/enhancement, forecasting, scenario analysis, contract research, forecast review meetings, and client support activities for U.S. Long-Term Forecasting Service.

Under the direction of Dr. Schink, the Wharton Annual Model was expanded in scope (from 850 variables to 2300 variables) to incorporate energy detail, demographic detail, and producer price detail. These changes were designed to enhance the Annual Model's usefulness for long-term planning and analysis. Research and development contracts to support the Long-Term Model enhancement activities were obtained from the Federal Energy Administration, the Electric Power Research Institute, the Office of Naval Research, Ross Laboratories, and the U.S. Department of Energy.

These model enhancement activities have led to contracts to perform long-term policy and scenario analyses for the groups supporting development as well as contracts from others such as the American Gas Association, the Whirlpool Corporation, the New York Stock Exchange, the General Accounting Office, the Joint Economic Committee, the U.S. Department of Commerce, Sun Oil Company, and the U.S. Department of Defense.

Executive Director, Special Projects, June 1972 - January 1977.

Directed the Commodity Model Maintenance Project (a joint effort with Charles River Associates, Inc.). This project involved the development of econometric models of the world markets for nonferrous mineral commodities. These models were used to produce five-year projections of demand, supply, and price, and to evaluate the effects of alternative General Services Administration commodity disposal patterns on these

commodity markets. Over a four-year period, twelve markets were analyzed: Cobalt, Copper, Chromite, Lead, Manganese, Mercury, Molybdenum, Platinum-Palladium, Rubber, Tin, Tungsten, and Zinc.

Developed a regional econometric model of Luzerne County, Pennsylvania, to evaluate the effects of Hurricane Agnes on this area.

Developed a large model of the U.S. auto industry based on time-series and cross-section data. This model, which was developed for the Transportation Systems Center of the U.S. Department of Transportation, was designed as a tool to investigate the longer-term determinants of the size and composition of the U.S. auto fleet and to provide a tool for the analysis of various potential policy initiatives.

Developed a model based on cross-section data for the National Association of Broadcasters to analyze the effects of increasing the number of imported signals carried via cable systems on the audience for local stations.

Participated in the development of Wharton's timesharing software system. Dr. Schink was involved in the selection of a time-sharing vendor, assembly of the programming staff, specification of the software capabilities, the incorporation of Wharton data bases and models in the new software system, the development of documentation and the initial marketing effort.

Participated in the design of the Wharton World Model system.

UNIVERSITY OF PENNSYLVANIA, Philadelphia, PA, Spring 1973.

Visiting Lecturer

THE BROOKINGS INSTITUTION, Washington, D.C., June 1969 - June 1972.

Principal Investigator, Quarterly Model Project

Responsible for directing the staff of the model project with guidance from senior advisors (primarily Lawrence R. Klein and Gary Fromm).

Specified and estimated the version of the Brookings Model which was used to perform analyses presented at the Conference on Research in Income and Wealth, Harvard University, November 1969.

Constructed a condensed version of the Brookings Model to study the gains and losses in simulation and forecasting accuracy associated with disaggregation of econometric models.

Organized a major conference devoted to a review of econometric model building, the contributions of the Brookings Model project, and the perspective for future developments, held in Washington, D.C. during February 1972.

UNIVERSITY OF MARYLAND, Department of Economics, September 1968 - June 1972.

Lecturer

Taught full-time during the 1968-69 school year and part-time (one course per semester) thereafter.

Courses taught include microeconomic theory, macroeconomic theory, mathematics for economists, and econometrics at both the undergraduate and graduate levels.

MATHEMATICA, Princeton, N.J., October 1967 - June 1968.

Consultant

Worked on the Northeast Corridor Project studying the determinants of travel between city-pairs.

UNIVERSITY OF PENNSYLVANIA, Philadelphia, PA, September 1965 - August 1968.

Research Fellow, Economic Research Unit

Worked for Lawrence R. Klein on the Wharton Quarterly Model Project. Under his direction, reestimated the entire model, developed computer software to solve the model, and mounted the model on a timesharing system.

Worked for Phoebus Dhrymes on several studies. Functioned as a programmer in implementing various distributed lag estimation techniques (search technique and spectral analysis technique) and estimated equations using three-stage least squares for a study of corporate investment, dividend, and borrowing policies.

Worked for Edwin Burmeister and F. Gerard Adams on several projects.

PROFESSIONAL HONORS AND ASSOCIATIONS

Board of Directors, Wharton Econometric Forecasting Associates, 1972-87.

William Carey Prize for Best Thesis in Economics, U of PA.

Ford Foundation Dissertation Grant, 1967.

Research Fellowship, Economic Research Unit, University of PA.

Member, American Economic Association & the Econometric Society.

PUBLISHED ARTICLES

"Short and Long Term Simulations with the Brookings Model" (with Gary Fromm and Lawrence R. Klein), in Bert G. Hickman (ed.) *Econometric Models of Cyclical Behavior*, New York: Bureau of Economic Research, 1972.

"Aggregation and Econometric Models" (with Gary Fromm), *International Economic Review*, February 1973.

"A Disaggregated Quarterly Model of U.S. Trade and Capital Flows: Simulations and Tests of Policy Effectiveness" (with Sung Y. Kwack), in Gary Fromm and Lawrence R. Klein (eds.), *The Brookings Model: Perspective and Recent Developments*, Amsterdam and New York: North-Holland Publishing Co. and American Elsevier Publishing Co., Inc., 1975.

"An Evaluation of the Predictive Abilities of a Large Model: Post-Sample Simulations With the Brookings Model," in Gary Fromm and Lawrence R. Klein (eds.), *The Brookings Model: Perspective and Recent Developments*, Amsterdam and New York: North-Holland Publishing Company and American Elsevier Publishing Company, Inc., 1975.

"The Brookings Quarterly Model: As An Aid to Longer Term Economic Policy Analysis," *International Economic Review*, February 1975. Reprinted in Lawrence R. Klein and Edwin Burmeister (eds.) *Econometric Model Performance: Comparative Simulation Studies of the U.S. Economy*, Philadelphia: University of Pennsylvania Press, 1976.

"An Overview of Econometric Model Building In And Of the U.S.A.: Subnational Macro Econometric Modeling," published in *Proceedings of the NSF-CNRS Conference on Macroeconometric Models and Economic Forecasting*, Universite de Paris, X-Nanterre, November 22-26, 1976.

"The International Tin Agreement: A Reassessment" (with Gordon W. Smith), *Economic Journal*, December 1976, Reprinted in *United Malaysia Bank Corporation Economic Review*, Vol. 13, No.2, 1977.

"The Practice of Macroeconometric Model Building and Its Rationale," (with E.P. Howrey, L.R. Klein, and M.D. McCarthy), published in *Large-Scale Macroeconometric Models*, Amsterdam, New York, and Oxford: North-Holland Publishing Company, 1981, pp. 19-58.

RESEARCH REPORTS, CONFERENCE PRESENTATIONS AND TESTIMONY

"Estimation of Forecast Error in a Dynamic and/or Non-Linear Econometric Model," presented at the Econometric Society Meetings, Evanston, IL, December 1968.

"Simulation with Large Econometric Models," presented at the ACM Summer Meetings, Denver, CO, June 1970.

Nonferrous Mineral Commodity studies prepared for the Office of Stockpile Disposal of the General Services Administration (jointly with various staff members at Charles River Associates).

Forecasts and Analysis of the Molybdenum Market, 12/72

Forecasts and Analysis of the Mercury Market, 3/73

Forecasts and Analysis of the Lead Market, 6/73

Forecasts and Analysis of the Zinc Market, 7/73

Forecasts and Analysis of the Cobalt Market, 3/74

Forecasts and Analysis of the Tungsten Market, 6/74

Forecasts and Analysis of the Lead Market, 5/75

Forecasts and Analysis of the Tungsten Market, 9/75

Forecasts and Analysis of the Manganese Market, 10/75

Forecasts and Analysis of the Mercury Market, 11/75

Forecasts and Analysis of the Manganese Market, 11/76

An Econometric Model of Luzerne County, prepared for the Department of Commerce, Commonwealth of Pennsylvania, June 1974.

An Analysis of the Automobile Market: Modeling the Long-Run Determinants, 3 Volumes (with Colin Loxley), prepared for the U.S. Department of Transportation, Transportation Systems Center, Cambridge, MA, February 1977.

"Financing the Energy Program" (with Lawrence R. Klein and Richard M. Young), testimony before the Subcommittee on Administration of the Internal Revenue Code of the Committee on Finance, U.S. Senate, June 6, 1977.

"The Oil Equalization Tax" (with William Finan), testimony before the Committee on Energy and Natural Resources, U.S. Senate, September 16, 1977.

The Impacts of Cable TV on Local Station Audience (with Sheela Thanawala), prepared for the National Association of Broadcasters, 1771 N Street, N.W., Washington, D.C. 20036, March 1978.

Analysis of the Macroeconomic Impacts of the Proposed NHTSA Passenger Car MPG Standards, prepared for the Chase Manhattan Bank, N.A., 1 Chase Manhattan Plaza, New York, N.Y. 10015, January 1979.

"U.S. Economic Prospects for the Next Ten Years," *The Wharton Magazine*, Winter 1979.

Simulation Study of Eight Petroleum Supply Disruption Scenarios, prepared for the Macroeconomic Analysis Division of the Energy Information Administration, U.S. Department of Energy, April 1979.

"Input-Output in the Context of the Wharton Annual Model" (with Gene D. Guill and Yacov Sheinin), Wharton Annual Model Working Paper Number 6, April 1978. Presented at the Seventh International Conference on Input-Output Techniques, Innsbruck, Austria, April 1979.

"Optimal Control and Macroeconomic Models," a paper prepared as part of a study entitled *Mexico--Economic Policy Analysis--1978/1983: A Macroeconometric Model of Mexico and Control Theory Applications*, by Oscar Adolfo Rufatt, under a grant from the Inter-American Development Bank, May 1979.

"Integration of Neoclassical Production Function Theory and Input-Output Matrices" (with Gene D. Guill and Yacov Sheinin), presented at a Seminar on Production Functions at the U.S. Department of Energy, May 21, 1979.

The Wharton Annual Energy Model: Development and Simulation Results (with William Finan), prepared for the Electric Power Research Institute, 3412 Hillview Avenue, Palo Alto, California 94304, EPRI EA-1115, Project 440-1, July 1979.

A Historical Analysis of the Impacts of Indexed Depreciation (with Sheila Bassett and Yacov Sheinin), prepared for the Sun Company, Inc., Radnor, PA, October 1979.

"A Macroeconomic Analysis of the Carter Energy Plan," presented at the Conference on Energy Prices, Inflation, and Economic Activity, Massachusetts Institute of Technology, Cambridge, MA, November 9, 1979.

The Macroeconomic Effects of Oil Supply Curtailments in 1985 and 1990 (with William Finan), prepared for the U.S. Department of Energy, December 1979.

A Macroeconometric Model to Allow Energy Policy Analysis of Changing Fuel Specific Prices on Production Capabilities (with Gene D. Guill and Yacov Sheinin), prepared for the Macroeconomic Analysis Division of the Energy Information Administration, U.S. Department of Energy, April 1980.

The Development of an Analytical Procedure for the Evaluation of the Effect on Energy Price Increases on Non-energy Commodities (with Gene D. Guill and Yacov Sheinin), prepared for the Macroeconomic Analysis Division of the Energy Information Administration, U.S. Department of Energy, April 1980.

Impact of Local Content Legislation On U.S. and World Economies, (with Colin Loxley), prepared for the Japan Automobile Manufacturers Association, Inc., July 1983.

Macroeconomic Analysis Of a Program For the Redevelopment of Troubled U.S. Industries, prepared for The Sun Company, 100 Matsonford Road, Radnor, PA 19087, October 1983.

Impact of the FCC Access Charge Plan On the U.S. Economy, (with Vijaya G. Duggal and John Green), prepared for the American Telephone & Telegraph Company, November 1983.

Brief Macroeconomic Analysis of S.1435: The Housing Opportunity and Mortgage Equity Act of 1983 (Home Act), prepared for the National Association of Home Builders of the United States, 15th and M. Streets, NW, Washington, DC, 20005, December 1983.

Testimony on Electric Power Demand in the PECO Service Area before the Pennsylvania Public Utility Commission, January 1985.

Analysis of the Impact of the Treasury Department's Initial 1985 Tax Plan on the Agricultural Sector of the Economy, prepared for the Granada Management Corporation, March 1985.

Impact of a Ban on the Use of Alachlor, prepared for the Monsanto Agricultural Products Company (with John M. Urbanchuk), March 1985.

Rebuttal Testimony on Projections of Electric Power Demand in the PECO Service Area, Pennsylvania Public Utility Commission, April 1985.

Testimony on the issue of the Economic Impact of the Gibbons Bill on the United States Economy before the Subcommittee on Trade of the Committee on Ways and Means, Washington, D.C., June 1985.

Assessment of the Likely Impacts of The President's Tax Proposals on Rental Housing Markets, prepared for the Tax Fairness for Housing Coalition (with Art Doud and William C. Apgar and H. James Brown of the Joint Center for Housing Studies of M.I.T. and Harvard University), July 1985.

Economy-Wide Impacts of Agricultural Sector Loan Losses, prepared for the Food and Agricultural Policy Research Institute (FAPRI) (with John M. Urbanchuk), July 1985.

Evaluation of the Impacts of the President's Tax Proposals on the Real Estate Industry and the Economy, prepared for the Real Estate Securities and Syndication Institute, October 1985.

An Analysis of the Macroeconomic Impacts of Tariff Induced Increases in U.S. Softwood Lumber Prices, prepared for the Council of Forest Industries, October 1985.

Testimony on The Economic Impacts of Implementing the Tax Reform Act of 1985 (H.R. 3838) before the Senate Committee on Finance, Washington, D.C., January 1986.

Rebuttal and Sur-Surrebuttal Testimony for PECO on the Impact of a Rate Increase on the Philadelphia Economy before the Pennsylvania Public Utility Commission, February-March 1986.

The Income of Organized Crime, prepared for the President's Commission on Organized Crime, March 1986.

National Consequences of Exporting Alaska North Slope Crude Oil, prepared for the Exxon Shipping Company, May 1986.

The Macroeconomic Costs of Limiting the Deductibility of Advertising Expenses, prepared for the American Association of Advertising Agencies, Inc., the American Advertising Federation, and the Association of National Advertisers, Inc., June 1986.

Pricing Telecommunications Services: The Impact on the U.S. Economy of Subscriber Line Charges, prepared for the American Telephone & Telegraph Company, August 1986.

GE Vehicle Price Forecasting System, prepared for the GE Credit Auto Leasing Company (with John A. Del Roccoli), September 1986.

Testimony on Home Air Conditioning Saturation Rates and its Effect on Peak Electricity Demand before the Indiana Public Service Commission, December 1986.

Effects on the New York Economy of Regulation of its Telecommunications Market, prepared for the American Telephone & Telegraph Company, January 1987.

Deregulating Telecommunications: Economic Impacts on New York State, prepared for the New York Telephone Company, February 1987.

Testimony on the Economic Effects of Relocating an Automobile Dealership in Canonsburg, Pennsylvania, before the Pennsylvania Board of Motor Vehicle Dealer Licensing, January 1987.

Testimony on the Determination of an Appropriate Discount Rate to Apply to the Expected Income of a Real Estate Syndication before the American Arbitration Association in New York, March 1987.

Testimony on the Economic Effects of Relocating an Automobile Dealership in Red Lion, Pennsylvania before the Pennsylvania Board of Motor Vehicle Dealer Licensing, March 1987.

Testimony on the Economic Effects of Allowing PHH, A Retail Auto Broker, to Operate in Pennsylvania before the Pennsylvania Board of Motor Vehicle Dealer Licensing, August 1987.

"Target Industry Study for Iron and Washington Counties, Utah" (with Kate Rodenrys), prepared for Pacific Power and Light Company, March 19, 1988.

The Impact on the U.S. Economy of Regulatory Changes in the Interstate Long-Distance Telecommunications Market, prepared for the American Telephone and Telegraph Company, October 1987.

Testimony on the Economic Effects of Relocating an Automobile Dealership in Minneapolis-St. Paul, Minnesota before the Minnesota Court of Common Pleas, October 1987.

Testimony on the Evaluation of Dealer Performance Related to Termination of the Dealership in Erie, Pennsylvania before the Pennsylvania Board of Motor Vehicle Licensing, October 1988.

Testimony on the Competitiveness in the Markets Served by Buckeye Pipe Line Company, L.P. in Oil Product Transportation, Phase I (Docket No. IS87-14-000), before the Federal Energy Regulatory Commission, Washington, D.C., April 1989.

Prepared Direct Testimony (Draft) on the Competitiveness of Markets Served by Sun Pipe Line Company in Oil Product and Crude Oil Transportation, Document Supplied to General Counsel, June 1989.

Analysis of Ohio and Indiana Markets for Refined Petroleum Product Transportation, Prepared for Buckeye Pipe Line Company, L.P., June 1989.

Analysis of Eastern Product Systems Market for Refined Petroleum Product Transportation, Prepared for Sun Pipe Line Company, July 1989.

Testimony on the Effects of Adding a New Buick Dealership in San Diego, CA, Before the California New Motor Vehicle Board, November 1989.

Deposition on the Effects of Adding a New Cadillac Dealership in Los Angeles, CA, Related to Proceedings Before the California New Motor Vehicle Board, 1989.

Deposition on the Effects of Terminating a Ford Dealership in Youngstown, OH, Related to Proceedings Before Ohio New Motor Vehicle Commission, 1989.

"Rural/Urban Cross Subsidies in the U.S. Long Distance Markets" (with Jerry Langin-Hooper), prepared for Bell Canada, 1990.

Deposition on the Effects of Adding a New Toyota Dealership in Los Angeles, CA, Related to Proceedings Before the California New Motor Vehicle Board, 1990.

Testimony on the Effects of Terminating a Jaguar Dealership in Orange County, CA, Before the California New Motor Vehicle Board, March 1990.

Testimony on the Effects of Adding a New Ford Dealership in Beverly Hills, CA, Before the California New Motor Vehicle Board, March-April 1990.

Analysis of Competition in Markets Served by Atlantic Pipe Line Company, Prepared for Sun/Atlantic Pipe Line Company, April 1990.

Developed an Econometric Model for Forecasting and Analyzing U.S. Auto and Light Truck Demand for a Consortium of Japanese Auto Makers, May 1990.

Testimony on the Effects of Adding a New Toyota Dealership in Tulsa, OK, Before the Oklahoma Motor Vehicle Dealer Commission, July 1990.

Prepared Analysis and Wrote Testimony Related to the Competition Faced by Amoco Pipe Line Company in Crude Oil Transportation, FERC Docket No. IS90-30-000, August 31, 1990.

Testimony on the Effects of Adding a New Toyota Dealership in Pittsburgh, PA, Before the Pennsylvania Board of Motor Vehicle Licensing, October 1990.

Presentation on the Effects of Adding a New Ford Dealership in Kansas City, Before the Ford Dealer Policy Board, October 1990.

"The Effects of Long-Distance Competition on Small and Rural Jurisdictions in the United States with Comparisons to Newfoundland" (with Jerry Langin-Hooper), prepared for Newfoundland Telephone, November 1990.

Deposition on the Effects of Adding a New Honda Dealership in Minneapolis-St. Paul, Related to Proceedings in Minnesota State Court, January 1991.

Testimony on Calculating the Cost of Capital Using the CAPM Model, A Barometer Group of Companies, and a Risk Premium Approach Rebutting Testimony by a Commission Staff Witness, prepared for Consumers Power Company and Presented Before the Michigan Public Service Company, Case No. U-9346, January 15, 1991.

Prepared Analysis and Wrote Testimony Related to the Competition Faced by ARCO Pipe Line Company in Oil Product Transportation, FERC Docket No. IS90-34-000, February 1, 1991.

Prepared Analysis and Wrote Testimony Related to an Evaluation of Georgia Power's Proposed Integrated Resource Plan Including Demand-Side Options Related to General Regulatory Treatment and Specific Programs for Interruptible Service Tariffs, High Efficiency Lighting, and Residential Demand-Side Initiatives, Docket No. 3979-U, Georgia Public Service Commission, April-May, 1991.

Testimony on the Competitiveness of Markets Served by Williams Pipe Line Company in Oil Product Transportation, FERC Docket No. IS90-21-000, June 1991.

Prepared a Study on the Design of a Residential Time-of-Use Experiment for Delmarva Power and Light, Wilmington, Delaware, June 10, 1991.

Testimony Presented Before the Canadian Radio-Television and Telecommunications Commission, Regarding Unitel's Application for Interconnection with Bell Canada, et. al. June 25, 1991.

Testimony on Evaluating Ratemaking Alternatives and Performance Incentives Including Revenue Decoupling (ERAM) to Encourage DSM by Electric Utilities, prepared for Orange & Rockland for presentation to the New York State Public Service Commission Staff, Case 89-E-176, July 18, 1991.

Testimony presented before the New York State Public Service Commission in the Matter of the Revision of Rates, prepared for Orange and Rockland Utilities, Inc. Natural Gas Operations, January 1992.

"Macroeconomic and Fiscal Effects of the Luxury Tax on High-Line Cars" prepared for the Federation Against Inequitable and Regressive Taxation (FAIRTAX), February 1992.

"Reply Comments on Behalf of Southwestern Bell Telephone Company," prepared for Southwestern Bell Telephone Company for presentation to the Arkansas Public Service Commission, March 26, 1992.

Testimony on the Differential Rate of Return Risk Faced by GTEC's Equity Investors, prepared for GTE California for presentation to the Public Utilities Commission of the State of California, May 1, 1992.

"Proposal to Implement the Fama-French Multifactor Approach to Estimating the Cost of Equity Capital for the New York Energy Utilities," submitted to the New York Energy Utilities, June 24, 1992.

"Dealing with Allegations of Market Power," presentation to The Pipeline Economics and Management Seminar, The Transportation Center, Northwestern University, November 4, 1992.

Economic analysis and exhibits prepared for Boulevard Ford, Courtesy Ford and Naughton Ford, Denver, Colorado, December 1992.

"Summary of Observations and Findings Relative to the Establishment of a Chevrolet Dealership in Glendora, California," January 1993.

Testimony presented before the New York State Public Service Commission, prepared for Orange and Rockland Utilities, Inc. (Electric), January 1993.

"Application of the Fama-French Model to Utility Stocks (with Richard S. Bower), presented in Proceeding on Motion of the Commission to Consider Financial Regulatory Policies for New York State Utilities (State of New York Department of Public Service Case 91-M-0509), February 1993.

"Evaluation of Alternative Price Cap Indices for the Lower 48 Oil Pipeline Industry" in "Comments of the Buckeye Pipe Line Company, L.P. on Commission Staff Proposal" before the Federal Energy Regulatory Commission in Docket No. RM93-11-000 Provisions to Oil Pipeline Regulations Pursuant to the Energy Policy Act of 1992, May 3, 1993.

Study measuring the value of a company providing mental health care insurance in a stock fraud case, prepared for Cole, Milstein, June 1993.

Rebuttal Testimony presented before the New York State Public Service Commission, prepared for Orange and Rockland Utilities, Inc. (Electric), June 1993.

"A Fairness 'Index' Model to Project Costs and Prices for PPL and UPL Operating as Separate Entities," prepared for PacifiCorp, June 24, 1993.

"Summary of Observations and Findings Relative to the Proposed Establishment of a Ford Dealership in Cordova, Tennessee," July 1993.

Affidavit before the Federal Communications Commission in the Matter of Implementation of Sections of the Cable Television Consumer Protection and Competition Act of 1992 Rates Regulation (MM Docket 92-266), concerning Commission computed benchmark rates for cable systems, prepared for Dow, Lohnes & Albertson, July 2, 1993.

Economic Analysis and Exhibits prepared for Tirapelli Ford, Joliet, Illinois, August 1993.

"Impact for the California Economy of an Exemption for the Manufacturing Sector from the 6 Percent Sales Tax on Machinery and Equipment Spending," prepared for Southern California Edison Company, August 1993.

Testimony presented before the New York State Public Service Commission in the Matter of the Revision of Rates (Case 93-G-0756), prepared for National Fuel Gas Distribution Corporation (New York Division), August 1993.

"Application of the Fama-French Model to Utility Stocks (with Richard S. Bower), submitted for publication in *Journal of Financial Markets*, August 3, 1993.

"Rate of Return Recommendations for the U.S. Cable Television Industry" (with Frank J. Hanley), presented to the Federal Communications Commission in Implementation of Sections of the Cable Television Consumer Protection and Competition Act of 1992 (MM Docket No. 93-215), prepared for Dow, Lohnes & Albertson, August 25, 1993.

"White Paper on Recommended Regulation for the U.S. Cable Television Industry" (with Joseph F. Brennan and Frank J. Hanley), presented to the Federal Communications Commission in Implementation of Sections of the Cable Television Consumer Protection and Competition Act of 1992 (MM Docket No. 93-215) as part of *Comments of Cable Operators and Associations*, prepared for Cole, Raywid & Braverman, August 25, 1993.

Affidavit before the Federal Communications Commission in the Matter of Implementation of Sections of the Cable Television Consumer Protection and Competition Act of 1992 Rates Regulation (MM Docket 92-215), reviewing the Comments of Dr. James H. Vander Weide, prepared for Dow, Lohnes & Albertson, September 13, 1993.

"Implementing Indexed Rate Increases: Grandfathered Pipelines Versus Those not Grandfathered," presentation to Oil Pipeline Ratemaking Strategies for the 90's: Impact of Anticipated FERC NOPR, September 29, 1993.

"How to Qualify for Market-Based Rates," presentation to Oil Pipeline Ratemaking Strategies for the 90's: Impact of Anticipated FERC NOPR, September 30, 1993.

Rebuttal Verified Statement presented before the Interstate Commerce Commission in Canadian Pacific Limited--Abandonment--Line Between Skinner and Vanceboro, Maine (Docket No. AB-213 (Sub-No. 4)), prepared for Canadian Pacific Limited, October 4, 1993.

Rebuttal Testimony presented before the New York Public Service Commission in the Matter of the Revision of Rates (Case 93-G-0756), prepared for National Fuel Gas Distribution Corporation (New York Division), January 1994.

Direct Testimony presented before the Federal Energy Regulatory Commission in Notice of Rate Change, Pacific Gas Transmission Company (Docket No. RP94-149-000) concerning Cost Rate for Common Equity, prepared for Pacific Gas Transmission Company, February 28, 1994.

Prepare Testimony on the Value of a Process that Benefited from a Gravity Bank, Whitehall Products Corp. vs. Golden et al., Civil No. 900905614CV, State of Utah, Case Settled, 1993-1994.

"Competition and Stranded Cost Recovery in the Electricity Sector." with Pablo T. Spiller and Daniel F. Spulber, part of Commonwealth Edison comments in Recovery of Stranded Costs by Public Utilities and Transmitting Utilities, FERC Docket No. RM94-7-000, December 9, 1994.

Direct Testimony presented before the Federal Energy Regulatory Commission on the justness and reasonableness of the rates of Williams Pipe Line Company in Oil Product Transportation, FERC Docket No. IS90-21-000 (Phase II), January 23, 1995.

Cross Examination before the Federal Energy Regulatory Commission on The Cost of Common Equity for Pacific Gas Transmission Company, April 19 and 24, 1995, FERC Docket No. RP94-149-000.

June 1995

Attachment 2

Mathematical Description of Dr. Besen's Model Structure Using Weighted Programming Hours

The regression model estimated by Dr. Besen is of the following form

$$\begin{aligned} \% \Delta(\text{Royalties}) = & A_o + A_L * \% \Delta(\text{Local}_w) + A_D * \% \Delta(\text{Devotional}_w) + A_s * \% \Delta(\text{Sports}_w) \\ & + A_M * \% \Delta(\text{Movies/Series}_w) + (\text{ErrorTerm}) \end{aligned}$$

where

$\% \Delta(\text{Royalties}) =$ The percentage change in royalties in the period when distant signals are changed

$\% \Delta(\text{Local}_w) =$ The percentage change in weighted hours of local programming carried on distant signals

$\% \Delta(\text{Devotional}_w) =$ The percentage change in weighted hours of devotional programming carried on distant signals

$\% \Delta(\text{Sports}_w) =$ The percentage change in weighted hours of sports programming carried on distant signals

$\% \Delta(\text{Movies/Series}_w) =$ The percentage change in weighted hours of movies/series programming carried on distant signals

$(\text{ErrorTerm}) =$ The component of $\% \Delta(\text{Royalties})$ that is not explained by the regression model.

The first model coefficient, A_0 , is the constant (intercept) term which can be interpreted as the expected percentage change in royalties if there was no change in the hours of programming. The model coefficients on the four percentage change ($\% \Delta$) explanatory variables (A_L , A_D , A_S , and A_M) can be interpreted as the fraction of 1% that royalties will change due to a 1% change in the explanatory factor. For example, if A_L were 0.1, this implies that a 1% increase in the weighted hours of local programming would result in a 1/10 of 1% increase in royalties. These unknown model coefficients are estimated using ordinary least squares regression by Dr. Besen and also here.

The (ErrorTerm) is a measure of what the model doesn't explain. Since regression equations are known to be approximations to the real world process being modeled, one expects that some of the movements in the dependent variable, here the $\% \Delta(\text{Royalties})$, will not be explained by the model. However, if the model is properly specified and incorporates accurate measures of all the important explanatory factors, then the (ErrorTerm) should be "relatively small." More precisely, in a properly designed and implemented model, one would expect that the variance of the (ErrorTerm) would be small relative to the total variance of $\% \Delta(\text{Royalties})$ or, equivalently, the percentage of variance explained by the model would be high. The R-squared (R^2) statistic can be interpreted as the percentage of the variance (changes) in the dependent variable, here $\% \Delta(\text{Royalties})$, that is explained by the model (i.e., by the explanatory factors which here are the percentage change in the weighted hours of programming for local, devotional, sports and movies/series, respectively).

Attachment 3

Mathematical Description of Dr. Besen's Model Structure Using Unweighted (Actual) Programming Hours

Dr. Besen's regression model, using actual hours of programming instead of the weighted hours of programming, is as follows:

$$\begin{aligned} \% \Delta(\text{Royalties}) = & A_0 + A_L * \% \Delta(\text{Local}) + A_D * \% \Delta(\text{Devotional}) + A_S * \% \Delta(\text{Sports}) \\ & + A_M * \% \Delta(\text{Movies/Series}) + (\text{ErrorTerm}) \end{aligned}$$

where

$\% \Delta(\text{Royalties}) =$ The percentage change in royalties in the period when a distant signal is changed

$\% \Delta(\text{Local}) =$ The percentage change in actual hours of local programming carried on distant signals

$\% \Delta(\text{Devotional}) =$ The percentage change in actual hours of devotional programming carried on distant signals

$\% \Delta(\text{Sports}) =$ The percentage change in actual hours of sport programming carried on distant signals

$\% \Delta(\text{Movies/Series}) =$ The percentage change in actual hours of movies/series programming carried on distant signals

$(\text{ErrorTerm}) =$ The component of $\% \Delta(\text{Royalties})$ that is not explained by the regression model.

The model coefficients, A_o , A_L , A_D , A_S , and A_M have the same interpretation as was the case for Dr. Besen's model based on weighted programming hours data. These coefficients are estimated using ordinary least squares regression.

Attachment 4

Signal-To-Noise Test for Unweighted Hours

SIGNAL-TO-NOISE TEST (UNWEIGHTED HOURS)

$$p_2 = 1 \text{ and } \beta_2 = 0$$

| | Degraded due to collinearity? [1] | Coefficient [2] | Standard Error [3] | ϕ^2 [4] | Inadequate Signal-to-Noise? | | | |
|---------------------------|--------------------------------------|--------------------|-----------------------|-----------------|--|--|--|--|
| | | | | | Less Stringent Test ($\alpha=0.05$, $\gamma=0.90$, F=11.0227) [5] | | Stringent Test ($\alpha=0.05$, $\gamma=0.999$, F=24.9845) [6] | |
| Constant (Intercept) Term | yes | 0.040157 | 0.04771845 | 0.71 | yes | Inadequate signal-to-noise, collinearity | yes | Inadequate signal-to-noise, collinearity |
| %Δ Local | yes | -0.013912 | 0.05181282 | 0.07 | yes | Inadequate signal-to-noise, collinearity | yes | Inadequate signal-to-noise, collinearity |
| %Δ Devotional | yes | 0.030859 | 0.03777172 | 0.67 | yes | Inadequate signal-to-noise, collinearity | yes | Inadequate signal-to-noise, collinearity |
| %Δ Sports | yes | -0.007646 | 0.09819658 | 0.01 | yes | Inadequate signal-to-noise, collinearity | yes | Inadequate signal-to-noise, collinearity |
| %Δ Movies/Series | yes | 0.901585 | 0.1869126 | 23.27 | no | Adequate signal-to-noise, collinearity | yes | Inadequate signal-to-noise, collinearity |

Sources:

[1]: Auxiliary R^2 close to or greater than equation R^2 .

[2], [3]: From Besen basic equation.

[4]: Test statistic, for definition, see Belsley, p. 213.

[5], [6]: "yes" if test statistic below critical F value; "no" if test statistic above critical F value.

Attachment 5

Distribution of Coefficients From Random Assignment of Observations

SCHINK ATTACHMENT 5

Attachment 5

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DISTRIBUTION OF COEFFICIENTS FROM RANDOM ASSIGNMENT OF OBSERVATIONS UNWEIGHTED HOURS UNSCALED COEFFICIENTS

| Variable | N | Minimum | Maximum | Mean | Std Dev |
|----------|----|------------|-----------|------------|-----------|
| DLLOCLHR | 18 | -0.2242000 | 0.1517000 | -0.0229500 | 0.0965904 |
| DLDEVOHR | 18 | -0.0368000 | 0.1314000 | 0.0285333 | 0.0460044 |
| DLSRTHR | 18 | -0.2133000 | 0.2605000 | 0.0086444 | 0.1567904 |
| DLMVSEHR | 18 | 0.5118000 | 1.3796000 | 0.9392111 | 0.2422997 |

| DLLOCLHR | Frequency | Cumulative Percent | Cumulative Frequency | Cumulative Percent |
|----------|-----------|-----------------------|-------------------------|-----------------------|
| -0.2242 | 1 | 5.6 | 1 | 5.6 |
| -0.1500 | 1 | 5.6 | 2 | 11.1 |
| -0.1265 | 1 | 5.6 | 3 | 16.7 |
| -0.1167 | 1 | 5.6 | 4 | 22.2 |
| -0.0879 | 1 | 5.6 | 5 | 27.8 |
| -0.0675 | 1 | 5.6 | 6 | 33.3 |
| -0.0542 | 1 | 5.6 | 7 | 38.9 |
| -0.0435 | 1 | 5.6 | 8 | 44.4 |
| -0.0286 | 1 | 5.6 | 9 | 50.0 |
| -0.0013 | 1 | 5.6 | 10 | 55.6 |
| 0.0095 | 1 | 5.6 | 11 | 61.1 |
| 0.0186 | 1 | 5.6 | 12 | 66.7 |
| 0.0212 | 1 | 5.6 | 13 | 72.2 |
| 0.0264 | 1 | 5.6 | 14 | 77.8 |
| 0.0742 | 1 | 5.6 | 15 | 83.3 |
| 0.0783 | 1 | 5.6 | 16 | 88.9 |
| 0.1074 | 1 | 5.6 | 17 | 94.4 |
| 0.1517 | 1 | 5.6 | 18 | 100.0 |

DISTRIBUTION OF COEFFICIENTS FROM RANDOM ASSIGNMENT OF OBSERVATIONS
UNWEIGHTED HOURS
UNSCALED COEFFICIENTS

| DLDEVOHR | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|----------|-----------|---------|-------------------------|-----------------------|
| -0.0368 | 1 | 5.6 | 1 | 5.6 |
| -0.0336 | 1 | 5.6 | 2 | 11.1 |
| -0.0219 | 1 | 5.6 | 3 | 16.7 |
| -0.0145 | 1 | 5.6 | 4 | 22.2 |
| -0.0068 | 1 | 5.6 | 5 | 27.8 |
| -0.0054 | 1 | 5.6 | 6 | 33.3 |
| -0.0034 | 1 | 5.6 | 7 | 38.9 |
| 0.0259 | 1 | 5.6 | 8 | 44.4 |
| 0.0286 | 1 | 5.6 | 9 | 50.0 |
| 0.0288 | 1 | 5.6 | 10 | 55.6 |
| 0.0316 | 1 | 5.6 | 11 | 61.1 |
| 0.0469 | 1 | 5.6 | 12 | 66.7 |
| 0.0500 | 1 | 5.6 | 13 | 72.2 |
| 0.0566 | 1 | 5.6 | 14 | 77.8 |
| 0.0657 | 1 | 5.6 | 15 | 83.3 |
| 0.0810 | 1 | 5.6 | 16 | 88.9 |
| 0.0895 | 1 | 5.6 | 17 | 94.4 |
| 0.1314 | 1 | 5.6 | 18 | 100.0 |

| DLSPTHRR | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|----------|-----------|---------|-------------------------|-----------------------|
| -0.2133 | 1 | 5.6 | 1 | 5.6 |
| -0.1955 | 1 | 5.6 | 2 | 11.1 |
| -0.1760 | 1 | 5.6 | 3 | 16.7 |
| -0.1734 | 1 | 5.6 | 4 | 22.2 |
| -0.1211 | 1 | 5.6 | 5 | 27.8 |
| -0.0901 | 1 | 5.6 | 6 | 33.3 |
| -0.0711 | 1 | 5.6 | 7 | 38.9 |
| -0.0553 | 1 | 5.6 | 8 | 44.4 |
| -0.0297 | 1 | 5.6 | 9 | 50.0 |
| 0.0199 | 1 | 5.6 | 10 | 55.6 |
| 0.0366 | 1 | 5.6 | 11 | 61.1 |
| 0.0940 | 1 | 5.6 | 12 | 66.7 |
| 0.1220 | 1 | 5.6 | 13 | 72.2 |
| 0.1374 | 1 | 5.6 | 14 | 77.8 |
| 0.1403 | 1 | 5.6 | 15 | 83.3 |
| 0.2251 | 1 | 5.6 | 16 | 88.9 |
| 0.2453 | 1 | 5.6 | 17 | 94.4 |
| 0.2605 | 1 | 5.6 | 18 | 100.0 |

DISTRIBUTION OF COEFFICIENTS FROM RANDOM ASSIGNMENT OF OBSERVATIONS
UNWEIGHTED HOURS
UNSCALED COEFFICIENTS

| DLMVSEHR | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|----------|-----------|---------|-------------------------|-----------------------|
| 0.5118 | 1 | 5.6 | 1 | 5.6 |
| 0.6614 | 1 | 5.6 | 2 | 11.1 |
| 0.7212 | 1 | 5.6 | 3 | 16.7 |
| 0.7461 | 1 | 5.6 | 4 | 22.2 |
| 0.7481 | 1 | 5.6 | 5 | 27.8 |
| 0.8002 | 1 | 5.6 | 6 | 33.3 |
| 0.8031 | 1 | 5.6 | 7 | 38.9 |
| 0.8390 | 1 | 5.6 | 8 | 44.4 |
| 0.8468 | 1 | 5.6 | 9 | 50.0 |
| 0.8696 | 1 | 5.6 | 10 | 55.6 |
| 0.9807 | 1 | 5.6 | 11 | 61.1 |
| 1.0109 | 1 | 5.6 | 12 | 66.7 |
| 1.0933 | 1 | 5.6 | 13 | 72.2 |
| 1.1642 | 1 | 5.6 | 14 | 77.8 |
| 1.2141 | 1 | 5.6 | 15 | 83.3 |
| 1.2280 | 1 | 5.6 | 16 | 88.9 |
| 1.2877 | 1 | 5.6 | 17 | 94.4 |
| 1.3796 | 1 | 5.6 | 18 | 100.0 |

- DLLOCLHR = The percentage change in actual hours of local programming carried on distant signals
- DLDEVOHR = The percentage change in actual hours of devotional programming carried on distant signals
- DLSPRTHR = The percentage change in actual hours of sports programming carried on distant signals
- DLMVSEHR = The percentage change in actual hours of movies/series programming carried on distant signals

Attachment 6

Mathematical Definition of the Principal Component
Variables Using Unweighted (Actual) Programming Hours

In the text, in the context of the Besen model structure, principle components are described as linear combinations of the original explanatory variables used in the model. Mathematically, the i th principal component (where $i = 1, 2, 3$ or 4), can be expressed as follows:

$$\text{PRIN}_i = B_{Li} * \% \Delta(\text{Local}) + B_{Di} * \% \Delta(\text{Devotional}) + B_{Si} * \% \Delta(\text{Sports}) \\ + B_{Mi} * \% \Delta(\text{Movies/Series})$$

where

$\text{PRIN}_i =$ The i th principal component ($i = 1, 2, 3, 4$)

$\% \Delta(\text{Local}) =$ The percentage change in actual hours of local programming carried on distant signals

$\% \Delta(\text{Devotional}) =$ The percentage change in actual hours of devotional programming carried on distant signals

$\% \Delta(\text{Sports}) =$ The percentage change in actual hours of sports programming carried on distant signals

$\% \Delta(\text{Movies/Series}) =$ The percentage change in actual hours of movies/series programming carried on distant signals

The parameters, B_{Li} , B_{Di} , B_{Si} , and B_{Mi} are the weights on the original explanatory variables used to form the i th principal component. For example, the values for these

weights for the first principal component ($i=1$) calculated based on the unweighted (actual) programming hours data are as follows:

| Programming Type | Weighting Parameter | Value of Weighting Parameter |
|------------------|---------------------|------------------------------|
| Local | B_{L1} | 0.4926 |
| Devotional | B_{D1} | 0.4492 |
| Sports | B_{S1} | 0.4972 |
| Movies/Series | B_{M1} | 0.5552 |